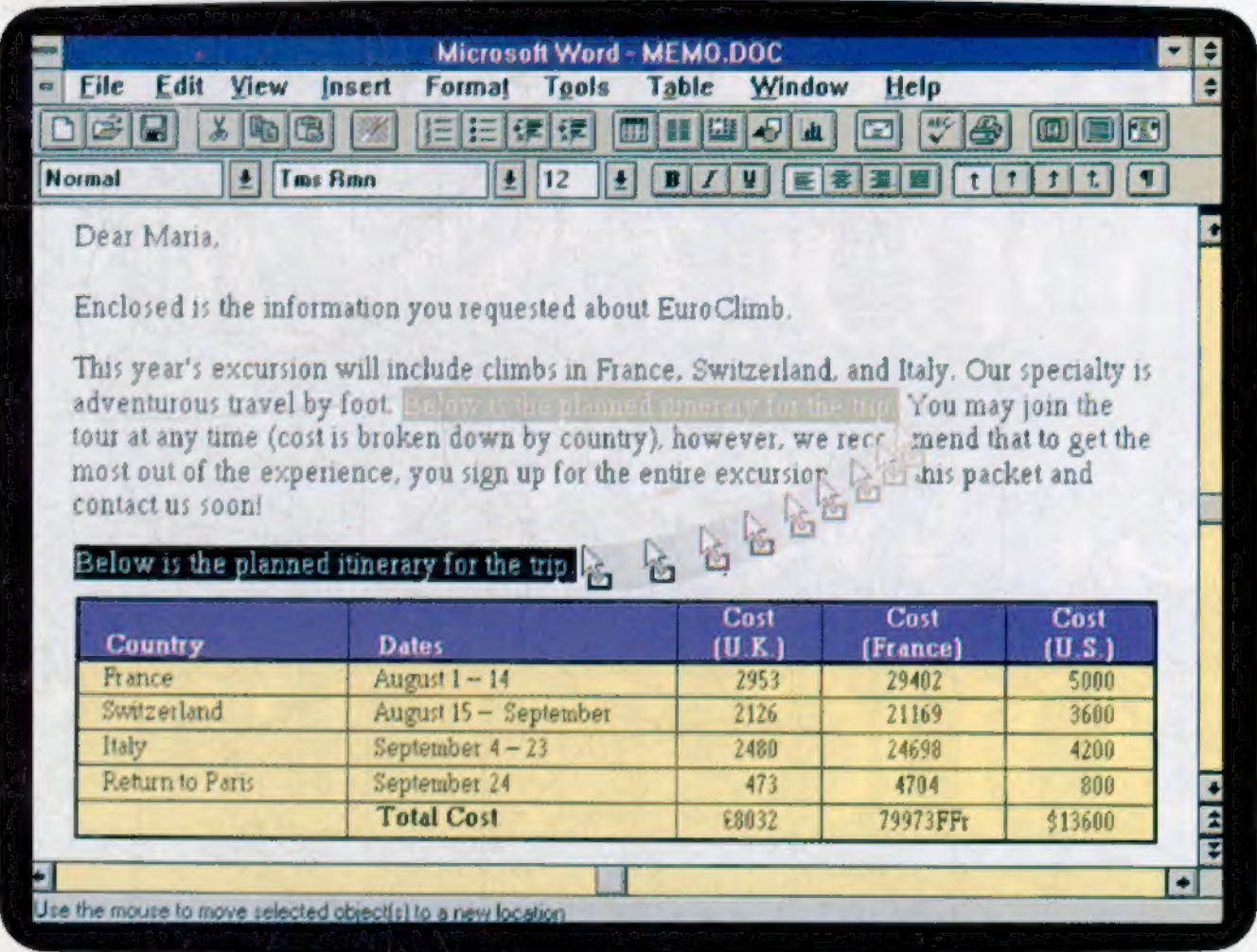


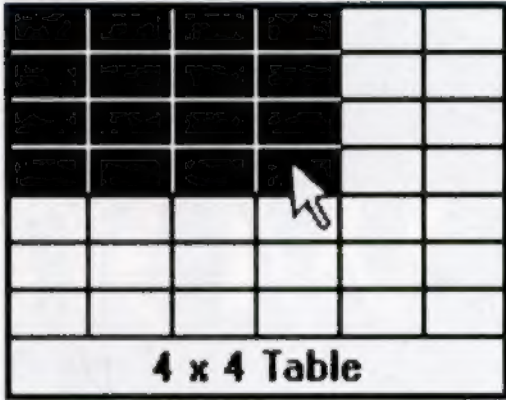
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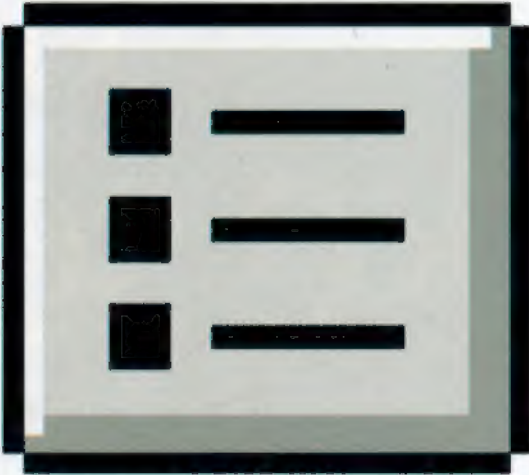
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TUESDAY, NOVEMBER 5, 1991



A computer price war...
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THE ALR BUSINESSVEISA 486/33 MODEL 101

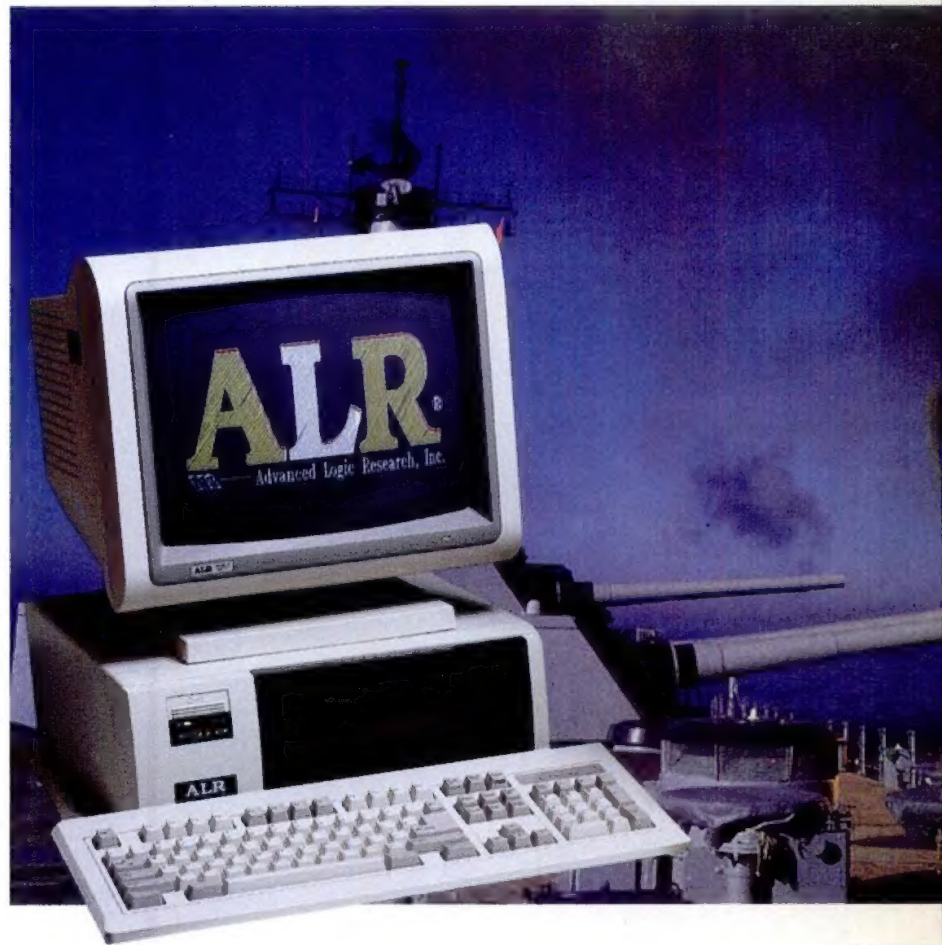
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length of the job is to bring the user's perspective to all of the evaluations we do."

How do we do that? By including the user's perspective in all of the scripts that lie behind our Suitability to Task ratings. "We break things down to the tasks that are the most common uses of the software and focus our evaluations on those real tasks," Ayre says.

"We bring benchmark tests, Suitability to Task ratings, and the reviewers' opinions together in our Editors' Choices," he adds. "That's something nobody else does."

Ayre's first major project was the Windows word processing evaluation in this issue, where he worked very closely with associate editor Don Willmott and contributing

editor Edward Mendelson to come up with Suitability to Task and performance tests, creating a detailed script that lies behind the reviews you see.

That's appropriate—because while word processing is a category where the major products have added feature after feature, users care most about how well and how easily the products let them create their documents.

Providing benchmark tests, technical analysis, and a user's perspective—that's our goal. With the help of people like Rick Ayre, we intend to keep advancing in all three areas.

—Michael J. Miller



PC Magazine Labs project leader Rick Ayre is uniquely qualified to bring a user's sensibility to our software testing.

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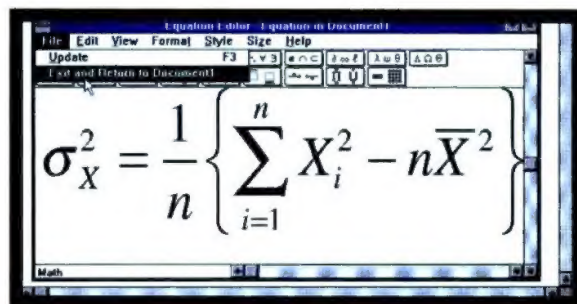
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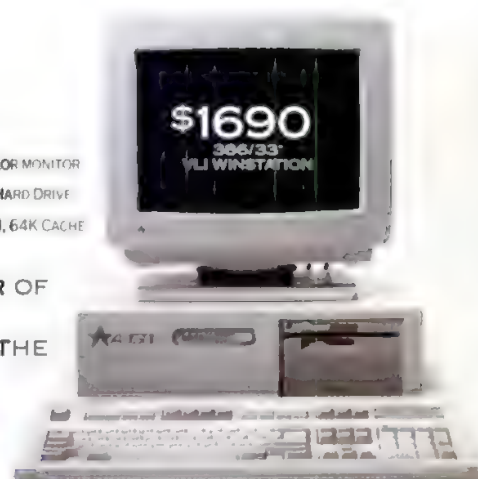
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Letters

TACKLING THE TAX QUESTION

What weird bug produced John C. Dvorak's truly half-baked political commentary on being "Taxed to Death in America" (December 17, 1991)? He encourages people to "get mad," but I feel puzzled when I read that the sales tax is "the worst kind of tax" and that "people hate it." Opinion polls have repeatedly shown that if forced to choose between this tax and income tax, Americans would rather have increases in sales tax.

I voted for Walter Mondale, who "actually ran on a platform of raising taxes!" I did not vote for George Bush, when he ran on a platform of "Read my lips: no new taxes." Mondale lost, and our economic infrastructure deteriorated, including our educational system. We wasted crucial years, and now we're in a great mess.

William P. Riley
Claremont, California

Of course taxes should be appropriate and fair. Of course we must as citizens maintain a vigilant posture to discourage abuses of our vulnerable position as taxpayers. But to say, "Public officials just don't get it—Americans don't like taxes" is just plain silly. The whole paralysis of the federal and state governments is almost entirely because they understand that Americans don't like taxes. Even though everything is falling apart around us, all our politicians do is make meaningless twiddles and tweaks to our revenue and expenditure system. This is a direct result of political expediency and cowardice, not because they fail to understand how people feel about taxes.

Bill VanAlstyne
Aptos, California

Dvorak's column touched on the truth: At 47 percent taxation, we are indeed highly taxed, and our economy (in recession) reflects the consequences. His proposed solution—to "keep a close eye on your state and local politicians"—hasn't worked in the past and won't work in the future.



John C. Dvorak's column proves taxing to some readers.

Our "two-party system" (de facto one-party) offers no real competition and is the problem. The solution is multiparty elections and term limitation.

PC Magazine and its subscribers wouldn't tolerate a choice of only two computer companies' products, but we live with a similar limit on our political process.

William J. Hickman
Granville, Ohio

Dvorak is right; the BBS tax should be eliminated. But he isn't right when he says we aren't doing anything about it. We're getting taxed from every angle, and it's hard to fight them all.

Frank Forster
Northport, New York

Sales tax on mail orders will be decided by the U.S. Supreme Court this session. A bill legislating a solution to mail-order-sales taxation has been languishing in Congress for years, due to lack of support from either business or the states. These problems could be resolved by legislation if the software industry could garner a constitu-

ency as vocal as Dvorak, or an industry group formed to combat unfair and unlawful state tax policies. Neither is likely because of apathy toward taxation of a constituency as diverse as the computer industry.

More tax problems await the computer industry. For one, there is the push to subject services to sales tax. Imagine, the state of New York might require Dvorak to collect sales tax from *PC Magazine* on the compensation for his column.

Jay Starkman, CPA
Atlanta, Georgia

Dvorak's column on taxes struck a nerve. Even though I was born and raised in California and have lived my whole life here, I am pulling up my family and business as fast as I can. Why? Besides the outrageous regulatory climate, the taxes are killing me.

Dvorak doesn't know the half of it. California does in fact "tax the air we breathe" many times over! The latest version of the air tax came the other day on my vehicle registration: \$4 for air quality! They have a lot of nerve charging \$4 for this air! I am going to Nevada where the air is still free, and you can't see it.

John LeRoy Johnston III
Sun Valley, California

JOHNNY CAN COMPUTE—IF HE'S RICH

Bill Machrone left out one essential item from the title of his December 17, 1991, article "Johnny Can Compute—at Home." It should have read "Johnny Can Compute at Home—if His Parents Are Rich Enough." Thanks to the Reagan revolution and our education president's policies, the schools have been robbed to help feather the nest of the burgeoning millionaire and billionaire classes.

Looking out from his ivory tower on Park Avenue, Machrone is unable to see the facts of life. The poor, who make up 40 percent of the population, hardly know that computers exist outside of the game room;

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CIRCLE 263 ON READER SERVICE CARD

Letters

the lower-middle class, another 10 percent, is struggling to make ends meet. That's 50 percent of the population excluded from his solution. The only thing I can think of to enhance his article would have been if the pen pals had communicated from their yachts with their laptops connected by cellular phones. Leave education alone, Bill.

Charley Moore
Charlottesville, Virginia

Once again, *PC Magazine* shows itself to be painfully out of touch with the economic woes facing the "typical" household, one that wishes to maintain a certain standard of living while finding some way to afford a practical home computer. Bill Machrone discusses the options facing those with a limited family budget. I wish my budget were so limited! His suggestion of a MPC (or one that can be readily upgraded) is ludicrous. Who on a limited budget has \$5,500 to \$6,000 to spare?

You should start reviewing some of those mail-order companies that offer dirt-cheap prices so that those of us with about \$1,000 to spend can get some assistance in making a reasonable choice. You might have some problem with these brands, though, since they don't usually purchase slick advertising in computer magazines, but they offer us a valuable alternative that you ought to bring to the attention of your readership.

Christopher P. Dunn
Downers Grove, Illinois

AL GORE RHYTHMS

There he goes again! In his column of November 26, 1991, John C. Dvorak bashes one of the most highly respected members of the U.S. Senate, the honorable Albert Gore. He states, "I've yet to be convinced that even Gore, who is considered one of the high-tech senators, knows anything at all about computers."

Today's musicians are able to write and edit their musical scores on computers considerably faster than by hand. This would be impossible were it not for the senator's extensive knowledge of computer language, which enabled him to write the basic arithmetic code the musicians use, called Al Gore Rhythms.

W.E. Manhein
Zachary, Louisiana

UNPLUG PLUG-IN PCS

Jim Seymour's "Plug-In PCs" column (November 26, 1991) is the first article I've read in a major computer publication that actually doubts the modular PC is for everyone. It's about time. There is considerable merit to purchasing a standard-size PC. It may not matter to the big corporations, but to home users and small businesses, a standard-size PC is a requirement for inexpensive maintenance and upgrades. Standard industry-available components are always less expen-

**DR DOS 6.0 seems to
be a hands-down
winner over DOS 5.0,
yet you include DOS 5.0
among the most
valuable products.**

sive than vendor-specific parts.

Nonstandard designs may not be supported in a few years. The vendor may be gone; the design may have been phased out. The only truly guaranteed upgradable PC is an industry-standard one. Only the vendors will profit from modular PCs. Another yuppie fad.

Phil Kimbro
Titusville, Florida

AT WHAT PRICE NEUTRAL IMPEDANCE?

Joe T. Rawlins (Letters, November 26, 1991) asks about the differences between the Radio Shack circuit tester and the ECOS Accutest II, since there was such a discrepancy between the prices. The Accutest will instantly perform the following tests: two hots in an outlet, neutral to ground short, neutral to ground reversal, isolated ground short, neutral impedance on circuits and equipment, and equipment ground impedance on circuits and equipment. It will also indicate the voltage level and scan for a combination of 125 wiring errors. I hope this clears up the confusion.

Chris Kleronomos
President
ECOS Electronics Corp.
Oak Park, Illinois



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PC WEEK REVIEWS

February 1991

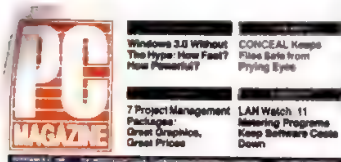


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Eight Low-Cost Systems Perform Well; Video and Hard-Disk Components Vary

By David Claiborne

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INFOWORLD Utilities Product Review*:

Norton Utilities 6.0	8.5
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Letters

WIRED FOR WHAT?

The November 12, 1991, issue contained an article "Wired for Intelligent Management: 10BaseT Hubs and Concentrators." In the article, the author states that there are three main network management systems: NetVIEW, CMIP, and SNMP. He also states that NetVIEW is generally more expensive.

The truth is that CMIP and SNMP are network management protocols, and of those mentioned, only NetVIEW is a network management system. NCCF, the NetVIEW predecessor, was originally designed to support only SNA devices. The latest release of NetVIEW, which is a host-based system, has broadened this support to non-SNA devices such as LANs. As for costing more, this is not a valid point, as you cannot buy CMIP or SNMP as standalone products.

You guys should publish an article describing how to integrate LAN management products with existing host-based ones such as NetVIEW.

Stephen Baird
Burlington, Ontario, Canada

DR DOS DISTRESS

What gives with you guys! In your issue of November 12, 1991, Joe Salemi gives a glowing report of DR DOS in which he points out that the earlier Version 5.0 had beaten MS-DOS by nine months, and that the new version—DR DOS 6.0—"leapfrogs MS-DOS 5.0, with task switching in RAM." Furthermore, it includes Multisoft's *Super PC-Kwik* cache, data compression that is compatible with disk defragmentation, better memory management, and other advanced features.

DR DOS 6.0 seems to be a hands-down winner over MS-DOS 5.0, yet you include MS-DOS 5.0 among the most valuable products of the year by deeming it a finalist for a technical excellence award.

You make the case that MS-DOS 5.0, though not as good, is more valuable because it will have more impact. What sort of logic is that? If you base your judgment on popularity, your very judgment will create positive feedback so that true excellence becomes of little importance. I have the feeling your objectivity is on a par with that of our politicians.

Bruce W. Shumway
Silver Spring, Maryland

PC DR DOS 6.0 offers an extended feature set that will benefit many, but MS-DOS 5.0 is a significant (and compatible) upgrade that has compelled more than 2 million users to upgrade. MS-DOS 5.0 gains back as much as 60K of memory for applications while remaining the standard among operating systems.—Ed.

CORRECTIONS & AMPLIFICATIONS

We printed the wrong test results for Datasouth's 18-pin Performax dot matrix printer in our November 26, 1991, special issue on printers. The correct draft text speed is 308 characters per second; the correct letter-quality text speed is 100 cps, and graphics speed is 3.1 graphics pages per minute.

Also in the special issue on printers, we correctly reported in the fact file and summary of features that the Seikosha LT 20 weighs 6 pounds without a battery and 8 pounds with one. In the review text, however, we incorrectly reported that the Seikosha LT 20 weighs 30 pounds.

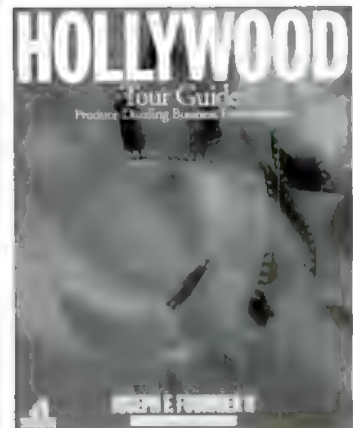
Also in the special issue on printers, we should have stated that the HP LaserJet IIISi uses Intellifont for Windows 3.0, which is developed by Agfa Corp. and is available at no charge from Hewlett-Packard; call 303-353-7650.

In "Low-Cost 2-D CAD: Computerized Design for the Rest of Us" (December 17, 1991), we should have stated that *DesignCAD 2-D* does export IGES files at no extra charge and does support the TIGA cards at both 640-by-480 and 1,024-by-768 resolutions. Furthermore, the phone number should have read 918-825-4844.

HOW TO WRITE TO PC MAGAZINE

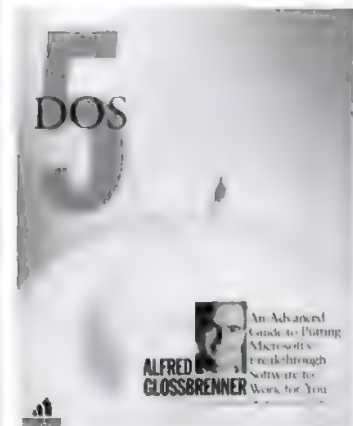
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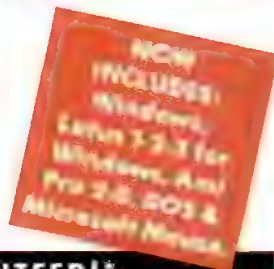
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■ *PC Magazine*, On Zeos '386 Speed, "The ZEOS blows away every other computer... a smart choice."

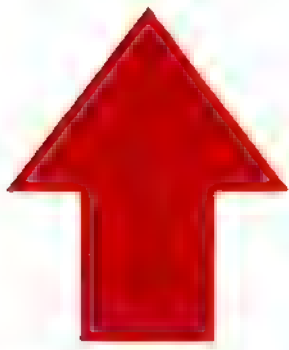
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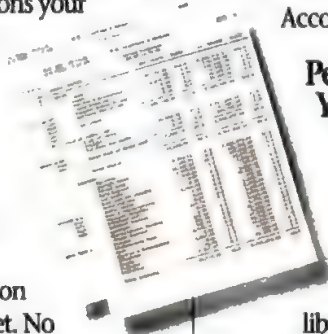


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Trends

Trends & Technology Shaping the Personal Computer Market

Looks Like a Form, Feels Like E-Mail

Imagine using forms that are so smart, they send themselves to the right person, make sure that the right blanks are filled in, come back to you for your electronic signature, and remind you if you're late turning them in. A new breed of software, variously called groupware, workflow management, mail-enabled applications, or smart forms, is coming into its own. These applications look like a set of simple forms but provide the power of a database and the convenience of electronic mail.

Lotus Development Corp.'s *Lotus Notes* is the oldest and most famous of the bunch, but e-mail developers Beyond Technologies, Reach Software, and forms designer JetForm have recently entered the fray. All four products depend on e-mail to transport information and all are

linked to databases for storage and information retrieval. Reach and Lotus position their products as application development environments, while Beyond addresses the needs of individual users. JetForm's package is closer to a mail-enabled application than a development tool.

THE CENTRAL COMPUTER MODEL

Lotus Notes uses a familiar model: data is stored centrally on a network server instead of on a minicomputer or mainframe. *Notes* gives users a rudimentary set of development tools to create custom databases. They can build applications that depend on *Notes* mail to manage communications between users. It only runs on OS/2 servers and costs \$62,500 for 200 users. You can get a more modestly priced

version from value-added resellers, starting at \$6,360 for five users.

Beyond recently began shipping Version 1.1 of *BeyondMail*, along with its new *Forms Designer*. *BeyondMail*'s main feature is the ability to separate the important messages from the electronic junk mail. The interactive Rules Editor lets you decide what messages get read first, which messages to forward, and which to ignore. The *Forms Designer* lets you create custom applications. You can import from and export to your favorite database in comma-delimited format, and even launch applications.

BeyondMail is available in four configurations. You can buy a server edition for \$695, a 5-node expansion for \$395, a 20-node expansion for \$1,395, and a remote-access version for \$295.

Forms Designer costs \$395.

BeyondMail requires *Novell NetWare MHS* (message handling service) and should support the mail application programming interfaces (MAPI) being developed separately by Lotus and Microsoft.



WorkMAN boasts a Windows interface and hooks to e-mail APIs.

JetForm has built workflow management features right into *JetForm 3.0*, its newest release. The product began shipping in November and costs \$795 for five users and \$2,395 for 20 users.

CONTINUES ON PAGE 32

E-Mail API: Lotus vs. Microsoft

The x.400 standard was supposed to link various proprietary e-mail systems. But it is so complicated that few vendors have bothered to implement it, and the x.500 directory services standard is still far off. Not surprisingly, software developers are rushing to try to create a de facto e-mail standard.

Developers want to use a consistent method to create, address, send, receive, and store electronic messages. A common interface would spawn a whole new generation of e-mail-enabled applications. A common e-mail application-program-



ming interface (API) would free developers from having to build separate hooks into *BeyondMail*, *cc:Mail*, and *Da Vinci eMail*, for instance.

But there lies the rub. Instead of one, the industry already has two rivals proposing separate APIs. Lotus—with support from Apple, IBM, and others—is designing the Open Messaging Interface (OMI), which will run on various platforms such as the Apple Macintosh and IBM's *OfficeVision* desktop. Microsoft's Mail Application Programming Interface (MAPI) is tightly bound to Windows. Novell, a key player in any network e-mail scheme, has been lukewarm toward both proposals.

One standard is likely to

emerge. Lotus's strength is the promise of cross-platform support and alliances with Apple and IBM, but according to Microsoft, it has sold 7 million copies of Windows.—Rick Ayre

1-Pound Computers

BIOS maker Phoenix Technologies Limited is licensing a design that will make it easier for laptop makers to develop 1-pound subnotebooks that use standard AA batteries. The design spec integrates all subsystem components with a ROM-based version of DOS 5.0 from Microsoft and a suite of applications from Lotus that includes the spreadsheet, word proces-

sor, and *dBASE*-compatible database from *Lotus Works*, as well as personal productivity software similar to that used on the HP 95LX palmtop. Phoenix is working with Distributed Information Processing Limited and Duracell on the battery component of the spec.

Although no vendors have announced specific product plans, subnotebooks based on the Phoenix specification are expected to weigh between 1 and 3 pounds, measure between 6 and 10 inches, run on standard AA batteries, and cost between \$500 and \$1,000. The current spec calls for Chips and Technologies' new single-chip PC Chip but will probably be expanded to include other processors.—Mary Kathleen Flynn



Pipeline

by Gus Venditto

Portable Software, Five Years Later

Instant obsolescence may be a fact of life in PC technology, but even in the usually hectic computer industry, some events move at a snail's pace. In 1987, Microsoft proposed a grand strategy for developing software on multiple platforms. Back then, OS/2's Presentation Manager graphical user interface was the ultimate target. It wouldn't be ready for two more years, but Microsoft told programmers they should get started right away, using Windows as the model.

Because Windows provided the same device-independence and graphical interface found on the Mac, code written specifically for Windows could be the foundation for a family of applications that would run on the Mac, Windows, and OS/2.

Developers were skeptical, and those who tried to move from one of these environments to another didn't have good things to say about the plan. Yes, some ideas—radical to PC programmers at the time—were common to Windows and OS/2, but just because both environments used link libraries and event-based commands didn't mean there was a lot of overlap.

Yet there was a core of truth in Microsoft's multiple-platform development scenario. No, it didn't make programming easier in the short term; and in fact, in some cases, a program running in one of those systems had to be completely rewritten for the other. But with long-range planning, applications *can* be built to be transportable.

To move successfully from one environment to another, developers have to isolate an application's core functions—the algorithms for making calculations on data, for example—and make them accessible by "edge code." The edge code can then be responsible for the housekeeping work (creating files, writing to

the printer, displaying fonts, and so on). If you have a family of applications, they can even share much of the edge code.

Some of the companies that stuck to this model are just now able to benefit from years of hard work. For example, Claris, the software arm of Apple that was spun off into an independent unit, will finally enter the Windows market in a serious way. Claris has been crafting its Mac applications so carefully that they're readily transportable. By the middle of 1992, the company plans to begin introducing Windows versions of most of its Mac products.

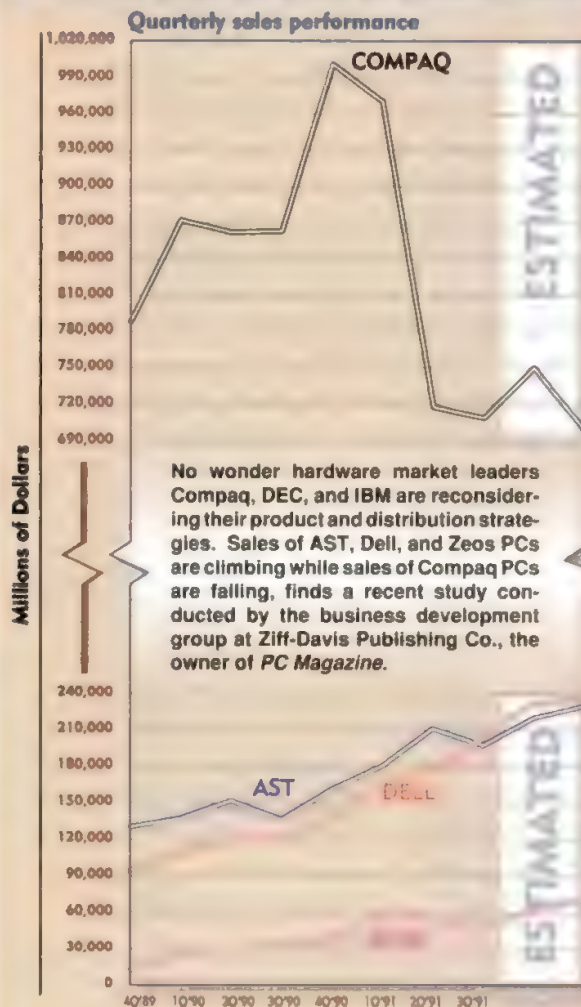
Claris plans to treat its applications as brands that will be available for all mass-market environments; right now, that means just Windows and the Mac, but it could mean OS/2 and Unix in the future.

Lotus probably took the biggest gamble on the multi-platform strategy. The three years of work required to bring 1-2-3, Release 3.0, to market can be directly attributed to work that made the spreadsheet transportable. Not only did the company move it from assembler language to C, but it isolated the basic functions in a core-edge model. The strategy eventually helped Lotus bring 1-2-3 to OS/2, Windows, and most recently, to the Mac.

Five years may seem like an inordinate amount of time to bring these three versions to market, but now that Lotus has made the transition, it can spend its energies on improving the performance and power of the core functions.

The jury's still out on whether these portable applications will be good enough to compete with software targeted at a single environment. We now know that the theory was sound—but was it worth the extra trouble? ■

Mail-Order Sales Rise, Compaq Sales Decline



Note: Quarters are calendar quarters, except for Dell, whose fiscal year ends in February. E = estimated.
Source: Ziff-Davis Publishing Co., from company reports and Wall Street analysts' estimates.

Inside Lexmark: A Taste of the New IBM?

When IBM sold its successful information products division last March, few outsiders paid much attention. But IBM's restructuring late last year lends new importance to the changing corporate culture inside Lexmark International, the former Lexington, Kentucky-based division of IBM that manufactured personal printers, typewriters, keyboards, and supplies.

To customers, Lexmark may still feel like Big Blue: IBM kept a 10 percent interest in the \$2-

billion company, and Lexmark products will continue to bear the IBM logo for the next five years. But Lexmark employees brandish a new pioneer spirit that bodes well for the corporate cultures of divisions still within IBM, such as the Personal Systems line of business, which gained some autonomy in manufacturing and pricing from the December restructuring.

Roughly 90 percent of Lexmark's 5,000 employees are former IBMers, about half of

DEC Expands Its Direct Sales Efforts

As hardware heavy hitters Compaq, DEC, and IBM struggle to turn around their market-share slumps, they seem to be casting wistful glances at mail-order houses such as Dell, Northgate, and Zeos, whose sales have been gaining steadily for the last couple of years. Compaq and IBM are still just exploring having more-direct relationships with their customers, but DEC is quickly stepping up to bat with a multimillion-dollar program called Desktop Direct.

Direct sales is not a new concept at Digital Equipment Corp., which has been quietly selling through its DEC Direct catalogs for years. But the new program, unveiled in late January, is DEC's first big step in

selling PCs directly to customers. The program's launch includes shipping catalogs to more than 600,000 PC buyers and an ad in the *Wall Street Journal*.

Best of all, the number two computer maker in the world seems to understand that there's more to the success of mail-order houses than their distribution methods: Low prices and good service are paramount. The Desktop Direct catalogs will contain lower prices than DEC has ever delivered. DEC traditionally keeps pricing information close to the vest, but a spokesperson said prices are 40 to 50 percent lower than the old ones. A fully configured 20-MHz 386SX, for example, was lowered to \$1,700 from \$3,500.

In setting the new prices, DEC plans to be competitive with brand-name mail-order houses such as Dell, Gateway 2000, Northgate, and Zeos. DEC is also providing the service benefits we've come to expect from mail-order houses: free on-site service and toll-free technical support under warranty. DEC customers will have access to the 30,000-plus staff in its service organization.

The January announcements concern existing products only, but new products are planned for spring release. DEC expects its PC business, which is a \$1.2 billion revenue source for the company, to triple this year, in part because of the Desktop Direct program.

Compaq and IBM are looking at direct distribution but neither has immediate plans; IBM sells some PCs through ads in education journals.

—Mary Kathleen Flynn

Price: One Very Good Reason to Shop Mail-Order

	33-MHz 486 PC with	20-MHz 386SX PC with
	• 8MB RAM • 160 to 200MB hard disk • SVGA monitor • DOS and Windows 3.0	• 2MB RAM • 50 to 80MB hard disk • SVGA monitor • DOS and Windows 3.0
Gateway 2000	\$2,945	\$1,645
Zeos	\$2,995	\$1,995*
Northgate	\$3,399	\$1,699**
CompuAdd	\$3,985	\$1,995
Dell	\$4,199	\$2,099
Compaq	\$6,627***	\$2,898
AST	\$6,685	\$2,795
IBM	\$10,745	\$4,145

*Monochrome VGA monitor

**120MB hard disk

***100MB hard disk

Compaq, AST, and IBM have a long way to go before their prices are competitive. Calls made in late December showed that PCs from these hardware giants cost roughly two to three times as much as comparably configured systems from mail-order houses Dell, Gateway 2000, Northgate, and Zeos. —Mary Kathleen Flynn and Tin Albano

whom had worked at IBM for 20 years or more. These days, the former IBM veterans have a hard time keeping the smiles off their faces. "We're really enjoying the new business. There's more opportunity for me to contribute," says a staffer whose previous business card carried the IBM Quarter-Century Club logo. "IBM was a great place to work, but you needed a certain number of signatures to accomplish something. Now I can just walk down the hall to get a decision," he says.

Another former "IBM-lifer" agrees: "At Lexmark, there are

three people between the chairman and me. At IBM, the number was so large, I couldn't count that high." One of the payoffs is a shorter product development cycle. "From inception to getting a product out the door, we're approaching cutting the time in half," he says, estimating that the traditional cycle was about two years.

Another benefit is a dedicated sales force. "Under IBM, printers were sold along with PS/2s," they say. "Now we've got a sales organization of 175 to 200 people dedicated solely to selling printers and typewriters."

The old sales strategy translated into a healthy 8- to 12-percent share of the personal printer market in 1990, according to BIS Strategic Decisions. InfoCorp. says it's more like 6 to 8 percent.

With 1991 figures not available yet, the success of the new company is still unproved. But Lexmark is off to a grand start: The company won three Editors' Choices in *PC Magazine's* printer blockbuster last November, and we gave Lexmark's IBM LaserPrinter 10 our Technical Excellence award for printers in 1991.

—Mary Kathleen Flynn

TOP 15 Software Sellers at Retail

RANK	COMPANY
1	QEMM-386 6.0 Quarterdeck Office Systems
2	WordPerfect 5.1 WordPerfect Corp.
3	Windows 3.0 Microsoft Corp.
4	Quicken 5.0 Intuit
5	Microsoft DOS 5.0 Upgrade Microsoft Corp.
6	The Norton Utilities 6.01 Symantec Corp.
7	Quicken for Windows Intuit
8	ProComm Plus 2.0 Datastorm Technologies
9	Stacker 2.0 Stac Electronics
10	Lotus 1-2-3 2.3 Lotus Development Corp.
11	Microsoft Word for Windows 2.0 Microsoft Corp.
12	DR DOS 6.0 Digital Research
13	PC Tools 7.1 Central Point Software
14	pcAnywhere IV Symantec Corp.
15	WordPerfect 5.1 for Windows WordPerfect Corp.

The list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending December 7, 1991. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market.

Sales information compiled by Ingram-Micro

BRIEFS

■ Owners of the HP LX95 palmtop will be among the first PC users to get wireless communications, with two products arriving in January. Motorola's \$299 NewStream Receiver lets users receive e-mail through a paging service such as EMBARC or SkyTel, with monthly charges of approximately \$50 to \$80. Ericsson's \$1,400 MOBIDEM allows two-way communications through the RAM Mobile Data packet-radio service, which costs 3 to 12 cents a message plus a monthly service charge ranging from \$15 to \$25. Both require HP's palmtop as well as its \$120 Mobile Data Link.

■ PostScript Plotter: One of PostScript's key selling points against competing scalable-font printer languages, such as HP's PCL 5, has been its support of a full range of output devices, from typesetting machines to desktop lasers. Until now, however, there hasn't been a PostScript plotter. Plotter manufacturer Synergy plans to change that. It has licensed PostScript from Adobe and plans to integrate the language into its line of Color-writer plotting systems.

■ Software developers aren't the only ones who have discovered the allure of CD-ROM disks. MCI has announced that it will distribute customer bills on CD-ROM. Microsoft expects to publish all its Windows applications on CD-ROM by the end of '92. Although Lotus won't go that far yet, it says the cost of publishing big programs on CD-ROM is cheaper than it is on floppy disks, especially if you include the manuals.

■ If you thought you could avoid computer viruses by staying away from bulletin boards, think again. You could get one from published software. In December, Novell sent a letter to roughly 3,800 customers, alerting them that some help diskettes had been infected with the Stoned III virus.

E-Mail

CONTINUED FROM PAGE 29

Unlike Notes and Reach's WorkMAN, the JetForm forms are stored on the user's workstation, so each user must have a licensed copy of the product.

JetForm works with cc:Mail and Da Vinci eMail and a Paradox Engine interface to completely automate forms delivery and database activity. JetForm can take advantage of such new features as global, intelligent data fields (which are fields smart enough to know they have already been filled in), and data

sets (the linking of forms so that the completion of one triggers the arrival of the next).

Reach plans to ship WorkMAN in the first quarter of 1992. The first release will run on networks running Banyan's VINES or Novell's MHS, and will require Microsoft Windows 3.0. Like BeyondMail, WorkMAN will support the e-mail APIs from both Lotus and Microsoft.

WorkMAN uses a flow-of-information model based on "organization, routing, and processing." You get a WorkMAN User Interface (a Windows-

based interface), the WorkManager (a sort of mail engine), and a set of WorkMAN Tools. The Tools, all visually oriented, enable you to create forms, manage workflow, and debug scripts. WorkMAN is built on Novell's Btrieve database, which maintains the relationships between messages, forms, and objects. It will be sold in open license packs (unlimited applications per server) at \$2,495 for five users and \$1,495 for a five-user license, as well as application-specific (runtime) packs at \$995 for a five-user server and \$595 for each additional five-user pack.—Rick Ayre

Who has the Second-Most Win Apps?

It's no surprise that Microsoft Corp. (with 11) makes more Windows applications than the other leading software developers. But who would have thought Computer Associates would come in second?

—Christopher Barr

①PageMaker
②Persuasion
③PhotoStyler
④FreeHand

①ObjectVision
②Turbo Pascal for Windows

①CA-Competel
②dBfast
③Simply Accounting
④CA-UpToDate
⑤CA-Textor
⑥CA-SuperProject
⑦CA-Cricket Image
⑧CA-Cricket Presents
⑨CA-Cricket Graph

①Ami Pro
②Lotus 1-2-3
③cc:Mail
④Freelance Graphics
⑤Notes
⑥Write

Aldus

Borland International

Computer Associates

Lotus Development Corp.

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③Picture Publisher
④Windows Draw

①Excel
②Word
③Project
④PowerPoint
⑤Office
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②Harvard Draw
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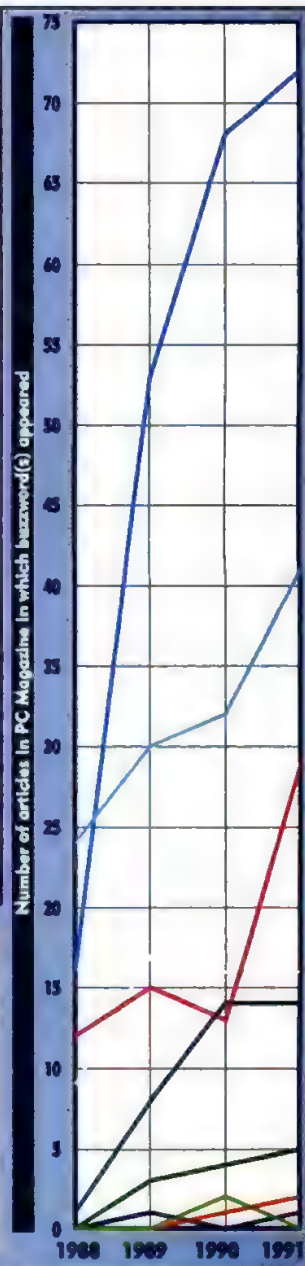
Symantec Corp.

Buzzword Watch

User friendly is Out. Objected oriented is close to death. Wanna sound cool when talking about computers? Keeping up with the buzzword du jour can require the astuteness of Miss Manners and the nimbleness of Barry Sanders. The New Age words of the nineties moment are already creaking at the joints: Cyberspace, fuzzy logic, neural network. The up-and-comer—at least this month—is virtual reality. Watch this space and we'll keep you at the head of the nerd pack.—Christopher Barr

Artificial Intelligence

— Cyberspace
— Fuzzy Logic
— MIPS
— Neural Network
— Object Oriented
— Usability
— User Friendly
— Virtual Reality



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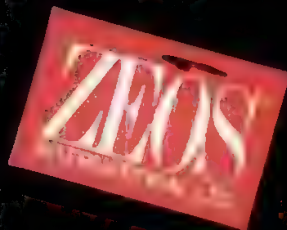
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First Looks

Hands-on Reviews of the Latest Products

Harvard Graphics for Windows: HyperShow, App Launcher Add Muscle to Presentations

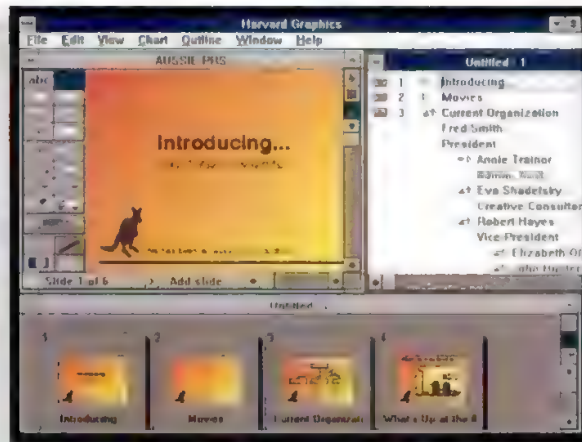
HANDS ON
by Carol Eason

Software Publishing Corp.'s *Harvard Graphics*, the market leader in DOS-based presentation graphics software, is one of the last of the heavyweight presentation products to find its way into Windows. But it arrives with enough promises for the future and mementos from the past to satisfy graphic adventurers and long-time *Harvard* users alike.

The \$595 *Harvard Graphics for Windows*, Version 1.0, features some classy new ease-of-use tricks, including on-screen color mixing to customize palettes, interactive dial-an-angle adjustments for gradient fills, and point-and-shoot assignments of screenshow transition effects. It also features the three modes of viewing presentations that are now *de rigueur* in Windows-based presentation programs: an outline, a slide editor, and a slide sorter.

Harvard Graphics' ability to launch other applications from within a presentation gives this product the edge for creating dynamic presentations. Application launching brings a new dimension to the HyperShow feature, which Software Publishing pioneered in *Harvard Graphics*, Version 2.3. HyperShow lets users build hot buttons in slides that, when clicked on, will branch to other slides. The Windows version allows users to assign hot buttons that will also launch applications.

The application launcher is new, but there's also much that's familiar in *Harvard Graphics*



Harvard Graphics for Windows features three views from which you can work: a slide editor (top left) for working on individual slides, an outline (top right), and a slide sorter (below) for organizing presentations.

for Windows. While other products shed DOS's forms-oriented approach in their Windows versions, *Harvard* uses data forms. Hence, you still get a form where you enter elements such as title, subtitle, and footnote. This should appeal to long-time *Harvard* users.

Users who prefer to avoid the

data forms can do so by entering titles, subtitles, and bulleted items for text charts in the outline. And within the slide editor, it's easy enough to click out of the form to enter text directly on-screen. There is, however, no way to set preferences to avoid the data form altogether.

Toshiba's T4400SX: 486 Power, 3-Hour Battery Life, And a Choice of Display



Toshiba's T4400SX is a machine of firsts. Not only is it the first notebook-class computer to sport both 486 processing power and a 3-hour battery life, it also has the distinction of being the only battery-powered notebook to offer an

optional low-power gas plasma display. We previewed a gas plasma unit (\$5,599) and found that the T4400SX offers a great mix of features and performance.

The T4400SX, which measures 2.2 by 11.7 by 8.3 inches (HWD) and weighs 7.5 pounds with its battery, uses a 25-MHz 80486SX processor. Its standard

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Beats the HP IIIsi at the 600-dpi network printing game.....44

Text is entered on-screen via a text box that pops up in the slide editor when you click on the gray labels—Title, Subtitle, and Footnote—that appear on-screen. The text box features a ruler that you can turn on to indicate your margins and to see how well the default font size will fit within them.

If *Harvard 3.0's* strength is charting, *Harvard Graphics for Windows's* strength is that it's designed to let you create entire presentations with the least possible fuss. At every turn, it exhibits the kind of simplicity that made its DOS partner so popular.

CONTINUES ON PAGE 38

configuration includes a 2.5-inch 80MB Conner Peripherals hard disk rated at 19 milliseconds, 2MB of fast 70 nanosecond RAM, a 1.44MB floppy disk drive, and either a 9.5-inch supertwist side-lit LCD panel or, for an extra \$300, a high-contrast, low-power gas plasma display. One parallel, one serial, and one PS/2-style mouse port come standard, along with a port for an external VGA card, a numeric keypad/101-key keyboard connector, and an expansion port connector for

CONTINUES ON PAGE 39

First Looks

Harvard Graphics for Windows

CONTINUED FROM PAGE 37

lar. The program even includes communications software and compression utilities that link to Autographix's slide service bureau.

PRESENTATION TEMPLATES

Harvard Graphics offers 55 presentation styles with backgrounds ranging from single colors to lovely scanned art images. In addition to backgrounds, each presentation style includes text and data chart templates using complementary fonts and colors that make it easy—though not quite as easy as with *Freelance Graphics for Windows*—to design a family of slides that share a common design. Before apply-

ing a style, you can preview it in a dialog box.

According to the preferences you set in the file menu, you can choose to begin your presentation in any one of the three views.

I found it easiest to begin in the outliner, where you can organize text for word charts and enter bullets and sub-bullets simply by hitting the Tab key and typing. The outliner displays text in ASCII characters so that the outline can be copied through the Clipboard to the Windows Notepad or to a Windows word processor for printing. You cannot print an outline directly from *Harvard Graphics* as its print facility handles printing only in graphics mode. Unlike *Freelance Graphics for Windows*' outliner, *Harvard*'s lets you collapse or expand outlines to view different levels of your presentation. And when you're finished entering text, you can spell-check a single slide or the entire presentation using the program's 130,000-word spell-

checker, which peruses spelling in data forms as well as in text charts.

You can select chart types from the 88 chart layout templates in the pop-up gallery, which you access from either the outliner or the slide editor. Before actually creating a chart slide, you can preview chart styles in the dialog box, which displays selections using the background, colors, and text and chart attributes of the chosen presentation style.

There are 11 different chart types available, including organization charts. Within an organization chart you can have up to nine levels, and there is no limit on the number of positions you can add under each level. You can also include hidden titles or comments.

Harvard for Windows includes a wide array of drawing tools that you can access from either the toolbox or the menu, or sometimes from both. The toolbox, however, cannot be customized to add commonly used features found only under menus. And although the Windows product includes a healthy number of drawing tools and color palettes to choose from—24 and 30, respectively—users coming over to the Windows version from *Harvard Graphics*, Version 3.0, may miss a few (see the sidebar). One handy tool not available in the DOS version is the "eyedropper," which allows you to copy colors and other attributes from one chart element to another.

The Windows program also supports Windows' dynamic data exchange (DDE) and features automatic links to spreadsheet data. It also supports a wide variety of import and export formats. It can import ASCII text, *Excel* and *Lotus 1-2-3* worksheets, and delimited ASCII files. It also reads all major graphics formats including both show and chart files from DOS versions of *Harvard Graphics*, .BMP, CGM, .PCX, .PCC, TIFF, and .WMF. It can export chart and show files to *Harvard Graphics*, Version 3.0, and the .BMP, CGM (*Freelance Plus*), CGM (*Harvard*), .PCX, TIFF, and .WMF formats.

By emulating many of the features and metaphors in its popular DOS-based counterpart



FACT FILE

Harvard Graphics for Windows

Software Publishing Corp., 3165 Kifer Rd., Santa Clara, CA 95051; 408-986-8000.

List Price: \$595. Upgrade prices: From *Harvard Graphics*, Version 3.0, \$50; from *Harvard Graphics*, Version 2.3 and earlier, \$125. Requires: 286-based PC (386 recommended), 2MB RAM (4MB recommended), 8MB hard disk space (for minimum number of options installed; 14MB required for all options), DOS 3.1 or later, Windows 3.0 or later.

In Short: *Harvard Graphics for Windows* takes the charting and drawing features that made its DOS program so popular, makes them easier to use, and adds the best that the Windows environment has to offer, including DDE and application launching. It's the obvious upgrade for *Harvard* users since its "design by forms" roots carry over.

CIRCLE 426 ON READER SERVICE CARD

FIVE REASONS TO STICK WITH THE DOS VERSION

Harvard Graphics for Windows doesn't put an end to DOS versions of *Harvard Graphics*, which Software Publishing says it will continue to market, support, and upgrade. Here are five reasons to stay put:

1. You don't use or plan to migrate to Windows in the near future.

2. You lack hardware horsepower. The Windows version will run on a 286-based PC with as little as 2MB of RAM, but performance will be poor compared to what you'll get from the DOS product on the same system. And if you want to take advantage of the many fonts, clip art, symbols, and color options that the Windows version offers, you'll need at least 14MB available on your hard disk.

3. You have drawing needs that can't be met using the tools in the Windows version. *Harvard Graphics* 3.0

features drawing tools you won't find in *Harvard Graphics for Windows*. For instance, Version 3.0 includes a Flip to Front/Back feature that allows you to move objects one in front of (or behind) the other. In *Harvard for Windows*, the feature only allows you to move an object to the very front or the very back.

4. You prefer to use Version 3.0's animation library instead of creating your own animations using screenshow effects. *Harvard Graphics for Windows* has no library of ready-made animations.

5. You need a Speakers' Notes feature. Unlike Version 3.0, which features Speakers' Notes, *Harvard Graphics for Windows* has only a Handouts feature that lets you enter text on a master handout page. You cannot use the facility to produce speaker's notes by entering individual notes next to individual slides in a multipage handout. —CE

(such as using F2 to preview an image), *Harvard Graphics for Windows* offers a painless introduction to Windows presentation graphics. And its impressive HyperShow and application launcher add interest and drama to presentations.

The program supports Microsoft's Multimedia Extensions, but the full implications of this support won't be felt until Intel releases its DVI (digital video interactive) multimedia boards. At that time, Software Publishing plans to make available its *Player* software, which can be launched from *Harvard Graphics* to bring full-motion DVI video plus sound and animation from the Multimedia Extensions into a presentation. For now, if you have a sound board and the Multimedia Extensions, you can incorporate waveform audio, MIDI audio, and animation.

If you're serious about presentation graphics, this is a serious product for you to consider. It's easier than any you'll find on the market. It's every bit as powerful. And it'll carry you farther into the future. ■

First Looks

T4400SX

CONTINUED FROM PAGE 37

Toshiba's Desk Station IV.

The T4400SX resembles Toshiba's T2200SX notebook design but is half an inch higher and roughly 2 pounds heavier. Part of the extra weight is due to the unit's 2.4-pound battery, which is a large, old-style nickel cadmium unit instead of the more efficient nickel-hydride type found in Toshiba's sleek T2200SX. Toshiba's engineers used the

larger nickel cadmium battery to give the power-hungry T4400SX a longer battery life. The manufacturer estimates that you'll get 3- to 3.5-hour battery life from the plasma-equipped unit, 3.5 to 4 hours from the LCD version, and even longer life with frequent use of the T4400SX's many power conservation features.

Toshiba sent *PC Magazine* a preproduction, gas plasma-equipped unit with a 15-watt battery; production models will

feature a more powerful 18-watt unit. Still, the T4400SX lasted 3 hours and 5 minutes on our Battery Run-down test with battery saving functions disabled, so Toshiba seems to be quite conservative in its battery life claims. The T4400SX can recharge the battery in about 90 minutes.

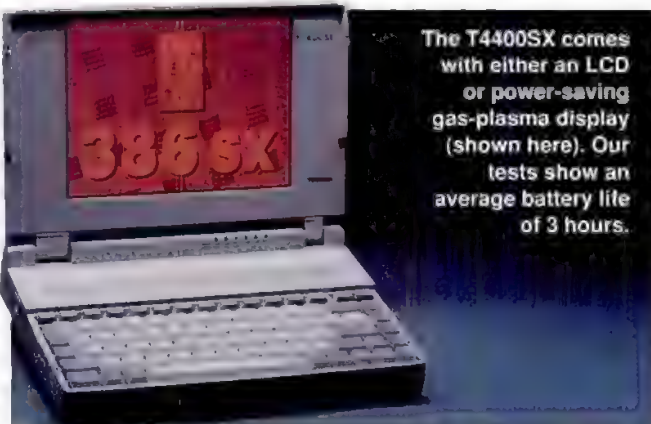
The system boasts several

program. Other options include a Semi-Bright mode, which dims the display slightly to save power, and a low-speed option for the I/O bus, which slows down the bus from 8 to 4 MHz without affecting the CPU's 25-MHz processing rate. The setup program also lets you specify a system password that you will have to

enter whenever you power up the machine.

Toshiba's famous Auto-Resume mode makes an appearance here as well. With Auto-Resume enabled you can, in most circumstances, shut off your computer while in the middle of an application, and when you

turn the computer back on you'll be right where you left off. This is not only a terrific convenience; it can be a lifesaver since Auto-Resume automatically kicks in if your battery dies while you're working. Toshiba's excellent documentation warns that Auto-Resume may not work well with some applications that use the processor's virtual 8086 mode, such as Microsoft Windows or Quarterdeck's *DESQview*. Try it with your own applications



power-saving options. For example, when you enable CPU sleep mode, the CPU is halted during periods of inactivity. You can also have the hard disk and display shut off automatically after a specified time-out period, and you can turn off power to the optional built-in modem when you won't be using it. Power is automatically restored to the CPU, hard disk, and display when needed.

All these options can be selected through the disk-based setup

FACT FILE

T4400SX

Toshiba America Information Systems Inc., 9740 Irvine Blvd., Irvine, CA 92718; 800-334-3445, 714-583-3000.

List Price: \$5,899 with gas plasma display, \$5,599 with LCD

In Short: A high-performance notebook computer with excellent features, 3 hours or more of battery life, and a choice of high-quality displays.

CIRCLE 427 ON READER SERVICE CARD

before you rely on it. Toshiba has promised a driver to resolve this problem.

You can upgrade the processor to a full 80486DX by removing the 486SX from its socket and plugging in a DX. With its 8K internal cache, however, the 25-MHz 486SX is a hot performer. Our preproduction unit finished the PC Labs 80386 Instruction Mix test in 1.45 seconds, compared to 3.09 seconds for the Compaq LTE 386s/20 and 1.43 seconds for the desktop Compaq Deskpro 486s/25M.

As with other Toshiba notebooks, you can expand system RAM using 2, 4, and 8MB memory cards that fit into a dedicated memory expansion slot. The 8MB card, list-priced at a hefty \$1,335, brings total system RAM up to its maximum 10MB. Standard software includes Toshiba MS-DOS 5.0 and disk-based hypertext help for both DOS and the T4400SX itself.

The 82-key keyboard is typical Toshiba—comfortable, responsive, and sensibly designed. It supports all 12 function keys and has four dedicated cursor-movement keys arranged in an inverted-T layout. Toshiba has the good sense to provide dedicated PgUp, PgDn, Home, and End keys, a must for anyone who spends any time in an editor or word processor. A dedicated function key accesses the numeric pad, which overlays the right side of the keyboard.

At 7.5 pounds, the T4400SX weighs in at the high end of the notebook scale. But if you're looking for 486 power in a small footprint, it's the only game in town.

PLASMA vs. LCD: Which to Choose?

If you're considering the T4400SX, which is available with two different displays, you may wonder which to choose. Since the plasma display panel uses only slightly more power than the sidelit LCD, you'll get good battery life with either type of display.

One of the plasma display's strong points is its refresh rate, which is substantially faster than the LCD's. This results in faster, snappier displays and is a plus when running GUI applications like Microsoft Windows. Another advantage is that you won't see any "mouse droppings"—

the ghosting effect that often accompanies the mouse cursor on LCD screens. The plasma display also boasts a contrast ratio that is seven times better than that of the LCD. This means text is sharper and it's easier to distinguish between shades of, well, orange. The plasma unit can be operated concurrently with an external VGA monitor, a big plus if you're doing presentations.

On the downside, you'll have to spend \$300 more for the plasma display, and it's more difficult to read in bright sunlight than the LCD. Finally, there is one subjective

consideration: If you can't stand orange, forget about the plasma display.

The sidelit supertwist LCD screen boasts 64 gray scales and is, according to Toshiba, the brightest LCD screen it has ever offered on a notebook. The 64 grays, however, are only available in 320-by-200 resolution. At standard VGA resolution you'll get 16 shades of gray, the same as with the plasma display. The LCD uses somewhat less power. According to Toshiba, you can expect to get about half an hour more battery life than you would with the plasma display.—SR

First Looks

Compaq's Colorful, Luggable 486c Is a Heavyweight Performer

HANDS ON
by Bruce Brown

Compaq's Portable 486c is a fine example of the engineering potential of high-powered computers-to-go. The luggable 486c, with its active-matrix color screen, EISA expansion bus, and 33-MHz 486 processor, has all the performance you're ever likely to need from a portable. In fact, it could be the only machine you'll ever need. In exchange for this power, however, you must forgo battery operation, carry a fairly heavy load, and pay a hefty price: \$9,999 for Compaq's Model 120 with a 120MB 19-millisecond hard disk, or \$10,999 for the Model 210 with its 210MB 12-ms. hard disk.

The 486c's biggest attraction is its active-matrix color screen. By combining TFT (thin-film transistor) LCD technology with a hot cathode backlit panel and Compaq's Advanced Video Graphics controller, the system can display 256 simultaneous colors (from a palette of 4,096) or 64 shades of gray at 640-by-480 resolution. The advanced VGA system is especially nice since it's integrated into the machine

and doesn't require use of an expansion slot. An external monitor hooked to a standard VGA port can simultaneously display the same resolution as the internal screen. It is not capable of supporting a Super VGA external display.

The 486c's display is fixed in the upright computer case, but you can adjust your viewing angle of the screen from minus 5 to plus 32 degrees by tilting the upper part of the case. The screen measures 8.5 inches wide by 6.5 inches high; its display area uses the full screen width but is only 5.25 inches high.

Images are bright, clear, and easily viewed even from the side. Thanks to the hot cathode back-lighting system, the colors are distinct and have high contrast. A brightness control is located to the right of the screen.

The 486c measures 15.6 inches wide by 11.5 inches high by 5.5 inches deep—roughly the size of a large radio "boombox." This design is very different from the Dolch P.A.C. line of lunch-box portables. The svelte Compaq 486c more closely resembles IBM's PS/2 Model P70 386 and P75 486 portables. Its longer,

skinnier design makes the machine feel lighter than its 17.5 pounds. The sturdy handle on the 486c is well-balanced enough to somewhat minimize the computer's weight, at least for short hauls. The handle folds flush with the top of the case when not in use. The 101-key keyboard forms one side of the closed unit and detaches from the front of the system. With a generous 4-foot coiled cable, it rests comfortably on a table or desk in front of the computer.

Expansion is hardly a concern, since Compaq has provided a raft of I/O connectors in its 486c. In addition to the external VGA monitor port, there's one serial port and one parallel port, an external keyboard port, a PS/2 mouse port, a connector for an external floppy disk drive or tape backup unit, a CD-ROM drive port, and an audio input jack. There's even a volume control for the PC speaker, making this machine well suited to traveling presentations.

To use the CD-ROM and audio input connectors you need optional internal adapters and external devices, but the 486c's provision for these multimedia-oriented peripherals is consistent with the machine's powerhouse design. For those who do add an audio input system and utilize the system's internal speaker, a volume control is located on the front panel.

The 486c's internal expansion possibilities include memory upgrades from the standard 4MB of RAM up to 32MB, modem and interface options, and slots for internal expansion cards.

An optional 2,400-bps Hayes-compatible internal data modem (\$599) fits in a special compartment inside the 486c's case so it doesn't require a regular expansion slot. The same compartment can alternatively hold an optional serial-only or combination serial and parallel interface card (\$149 each). Each of the two EISA expansion slots can hold a full-length EISA or ISA card, including Compaq's ESDI hard disk controller. With this controller, users can connect Compaq's external Fixed Disk Expansion Unit, which will provide up to 1.3 gigabytes of disk storage—more storage than you



FACT FILE

Compaq Portable 486c

Compaq Computer Corp.,
20555 State Hwy. 249,
Houston, TX 77070; 800-231-0900, 713-370-0670.
List Price: With 4MB RAM, 120MB hard disk, 1.44MB 3.5-inch floppy disk drive, \$9999; with 210MB hard disk, \$10,999. 2MB RAM upgrade, \$319; DOS 5.0, \$99; 2400-bps data modem, \$599.
In Short: Compaq's AC-power-only 33-MHz 486 luggable has a beautiful color screen and delivers all the power you're likely to need, if you can bear the weight (17.5 pounds) and afford the price.

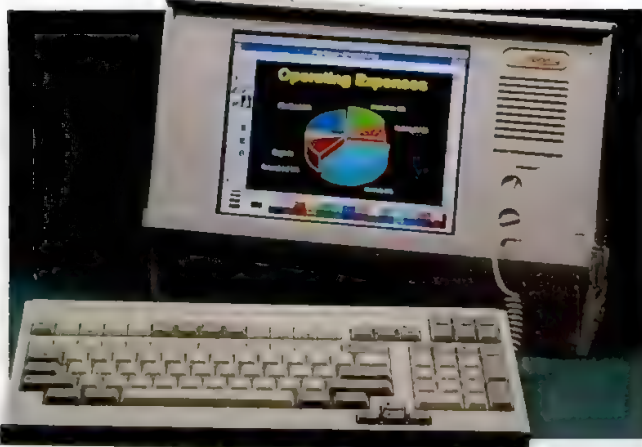
CIRCLE 429 ON READER SERVICE CARD

get with most desktops. And with a test score of 1.10 seconds on PC Lab's 486 Instruction Mix test, the 33-MHz 486c matches the performance of similarly configured 33-MHz 486 desktop systems.

The 486c has a wide range of security features. The simplest of these are a cable lock bracket and a keylock to prevent access to internal slots and system configuration switches. More sophisticated security provisions let you disable drives, I/O ports, and EISA configuration access. You can set passwords for system power-on, keyboard activation, and hard disk access, with the last remaining in effect even if the hard disk is removed from the computer. There's a network mode to protect the network from unauthorized access.

To spend \$10,000 on an AC-only portable computer that weighs 17.5 pounds, you would have to want the 486c's combination of components and features pretty badly.

Compaq provides a generous mix of features that offset the expense. Don't compare the Compaq Portable 486c to notebook systems. Instead, take a look at the heavier laptop and luggable computers that often weigh just as much (or more) but don't have the 486c's quality screen, CPU, security, expansion options, or presentation options. With all the right ingredients, the 486c might just be the only system you'll need. And who said you can't take it with you? ■



The 486c combines a vivid active-matrix color display, numerous security features, CD-ROM drive port, and an audio input jack, making it one of the best-equipped rigs for the road—especially for traveling presentations.

300 *dpi*

&

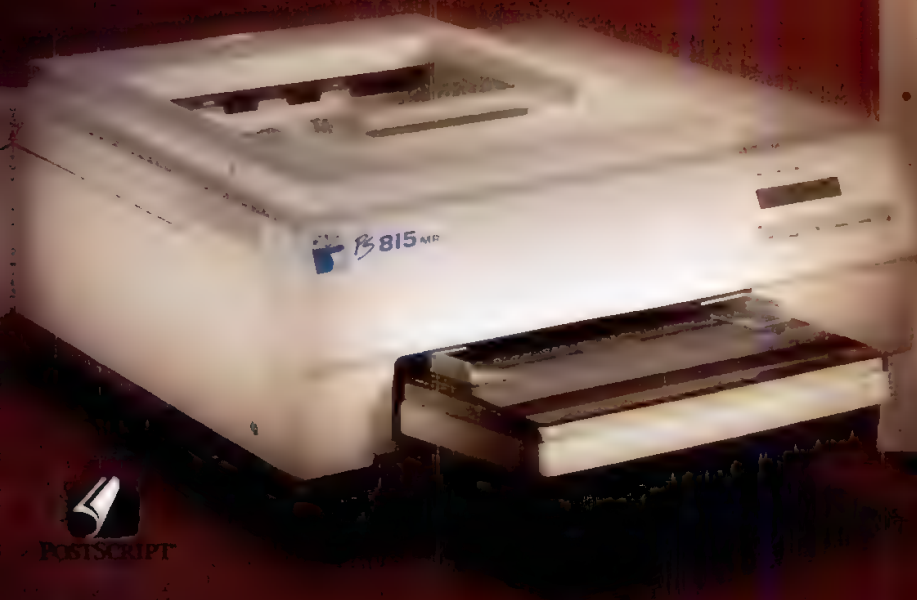
600 *dpi*

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QMS

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Alpha Four 2.0: Scripts and Network Support Added to Top-Notch Database

HANDS ON
by Joe Salem

When we last looked at *Alpha Four* (\$495, from Alpha Software Corp.) in our roundup of nonprogrammable database programs (December 17, 1991), we remarked on how powerful the program was without any compromise on ease of use. Now, remaining competitive with its nearest rival (Symantec's *Q&A 4.0*), *Alpha Four*, Version 2.0, has delivered on the promise to be even more powerful without giving up the features that earned it our Editors' Choice.

The most important addition is a powerful script language that makes it easy to create complex database applications. Other improvements include full network support, better memory management, data security features, and new functions.

The first change you'll notice when starting up *Alpha Four* 2.0 is the new interface, which replaces the old text menus with a character-mode graphical menu that uses shadow boxes, pop-up menus, and pick-lists. Full VGA palette support is among the many new configuration options. A number of default palettes are included that can be used the way they are or edited, and custom color combinations can also be set up. A telephone dialer has been added, as well as support for PostScript printers.

Alpha Software has increased the number of indexes per database to 15 and has rewritten the indexing algorithm to increase indexing speed. *Alpha Four* still uses *dBASE* .DBF files as its native format, but you must update indexes from prior versions to the new format. A utility is included to automate the process.

You can open up to ten databases at the same time, and you can save a collection of databases as a "Desktop," which will open all the associated data-

bases when loaded.

This enhanced robustness is the result of *Alpha Four*'s improved memory management. The RAM requirement to load the program has been reduced, and the program will use EMS or XMS memory to increase performance. A new shell-to-DOS option swaps the program to EMS, XMS, or disk, leaving only a 6K signature in RAM.

Version 2.0 adds full support for Novell or NetBIOS networks, automatically locking records and files as needed. Databases can be opened in either exclusive or shared mode, and view or browse screens are automatically updated when changes are made to a record by another user. You can assign passwords to databases, forms, reports, mailing labels, global updates, and browse layouts, and restrict use of commands such as **CHANGE** or **DELETE**.

Alpha Four has added a number of built-in features including financial, date, time, and trigonometric functions. Programmers designing point-of-sale applications will find the new **CCVALID** function handy. It's used to checksum credit card numbers

to ensure that they're entered correctly. Also new is **SOUND-EX** support, making it possible to do "fuzzy" searches when the exact value isn't known. A new crosstab feature summarizes a database on two dimensions and saves the results in a separate database.

POWERFUL SCRIPT LANGUAGE

The big news is the addition of a powerful, flexible script language. With prior versions of *Alpha Four*, you created applications using keystroke macros that had to be associated with a main menu choice. Scripts in Version 2.0 expand on keystroke macros and can be run from anywhere within *Alpha Four*: from a pop-up list or from other scripts or macros.

The program supports two types of script—keystroke scripts and dialog scripts. You can create and modify keystroke scripts to play back keystrokes by using the enhanced script recorder, which now lets you append keystrokes to existing scripts. Or, you can use the full-screen script editor that supports pop-up pick-lists of commands, common keystrokes, and functions. Macros can also be edited through the full-screen editor.

Dialog scripts create pop-up dialog boxes that you can use to display information, prompt the user for information, or present a menu of choices that call other scripts.

Prompt dialogs make use of a



FACT FILE

Alpha Four, Version 2.0
Alpha Software Corp., One North Ave., Burlington, MA 01803; 800-451-1018, 617-229-2924.

List Price: Single-user version, \$495; multiuser version, \$549. Network Packs: 3 users, \$749; 5 users, \$1,249. Single user upgrade from Version 1.1, \$69; multiuser upgrade, \$139; standalone upgrade from any competitor's database, \$99.

Requires: 512K RAM (640K recommended); DOS 2.0 or later; DOS 3.1 or later for network use.

In Short: *Alpha Four* 2.0 is a powerful database program that's easy enough for casual use yet capable of creating and running sophisticated applications. Its use of .DBF files as its native format makes it an ideal alternative for those who don't want to deal with the complexities of *dBASE*.

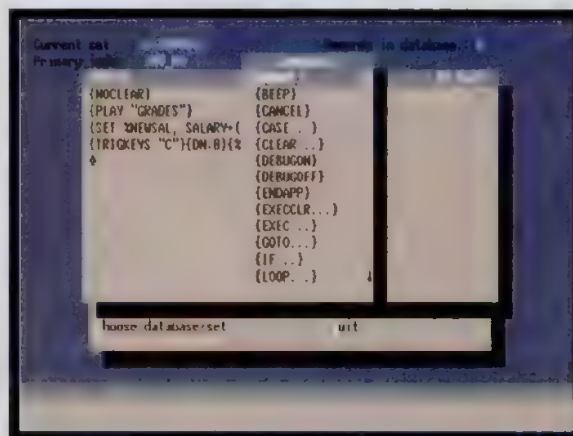
CIRCLE 420 ON READER SERVICE CARD

new feature called "script variables." These memory variables perform actions such as defining runtime search ranges and updating records by calculating new values from existing data.

A special class of script variables is used to define "trigger events" so you can automatically execute a script when an action (such as saving or deleting a record) takes place. If you give a script the same name as a database, the script is associated with a new menu choice called "Tools."

Alpha Four provides two external utilities to manage scripts. **SCRIPTED** converts scripts between the program's internal format and plain ASCII text so you can use your favorite editor to create and modify scripts. **A4LIB** creates script libraries by combining up to 500 individual scripts into one file, making it easy to keep related scripts together for distribution with a database application.

Alpha Four 2.0 builds on its reputation as a powerful yet easy-to-use database for nonprogrammers. If you're looking for compatibility with *dBASE* files without actually having to learn *dBASE*, you'll find *Alpha Four* an ideal alternative. ■



Alpha Four 2.0 adds support for complex scripts, which can be created either by recording keystrokes or through the script editor using pop-up pick-lists of commands and functions.

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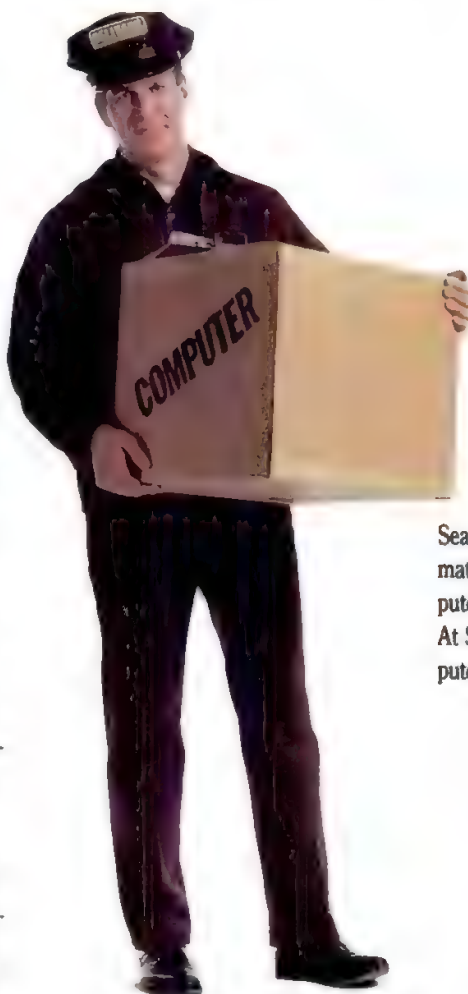
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First Looks

QMS-PS 1700: 600-dpi PostScript Laser Busts Network Bottlenecks

by Susan G. Thomas

Ten months after Hewlett-Packard introduced its shared network printer, QMS has introduced a viable alternative to the HP LaserJet IIIiS—the QMS-PS 1700. QMS's first network laser, the QMS PS-2000 (a *PC Magazine* Editors' Choice, November 26, 1991) is a 20-page-per-minute, 187-pound behemoth, but with a list price of \$15,995, it is in a class by itself. The PS 1700, however, is a different story.

At \$8,995, QMS's PS 1700 seems much more expensive, at first glance, than HP's \$5,495 IIIiS. They both share the same 17-ppm Canon NX engine, feature the same twin 500-sheet paper cassettes, and claim a duty cycle of 50,000 pages per month. But the PS 1700 offers superior network-managing capabilities, more memory, Adobe PostScript, and 600-dot-per-inch (dpi) output resolution in its standard configuration. This impressive list of features for \$8,995 make the PS 1700 extremely attractive to users looking for a proficient network printer with typeset-quality output.

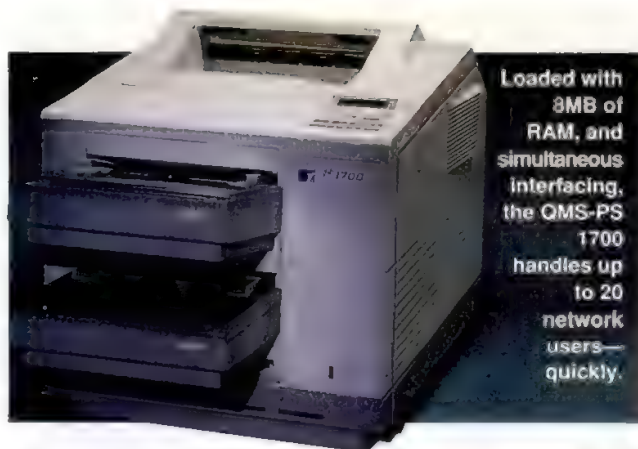
While the HP IIIiS is geared to workgroups of 11 users, the PS 1700 can handle up to 20—quickly. It exceeds the IIIiS's 16-MHz processing with a 25-MHz Intel 80960 RISC-based processor. It also features 8MB of RAM standard, upgradable to 16MB, compared to the 1MB in the IIIiS. Its extra speed and

memory rev up printing processing time, cutting network bottlenecks down considerably.

The PS 1700 offers another vital networking feature: QMS's simultaneous interfacing. Instead of offering Ethernet and Token-Ring as standalone options, the PS 1700 provides direct connection to network interfaces like DECnet and TCP/IP Ethernet (\$1,995 apiece), as well as *NetWare* via Ethernet and Token-Ring (\$995). LocalTalk, RS-232 serial, and Centronics parallel interfaces are standard. QMS's simultaneous interfacing function lets you print jobs from different interfaces on the network at the same time, thus freeing the host for other jobs—another bottleneck-buster. Also, all interfaces have 16K user-configurable input buffers, which can be upgraded with optional memory to maximize resident job-spooling.

Besides excellent network managing, QMS-PS 1700's most attractive asset is its 600-dpi resolution. The QMS-PS 1700 delivers either 300- or 600-dpi output, selectable from the control panel, using QMS's proprietary Multi-Res technology. The 600-dpi difference is most noticeable in graphics output. Gray-scale images emerged from the PS 1700 elegantly shadowed and shaded, giving the image more depth. But printing graphics in 600-dpi will slow performance.

In HP PCL 4 emulation, the PS 1700 rated 2.6 graphics pages per minute (gppm) at 300 dpi. At 600 dpi, however, it came in at a comparatively sluggish 1.1 gppm.



Loaded with 8MB of RAM, and simultaneous interfacing, the QMS-PS 1700 handles up to 20 network users—quickly.

Still, the graphics speed results for the PS 1700 beat just about every network printer in its class, including LaserMaster's TrueTech 1200, NCR's 6436-0301, and TI's microLaser XL PS35. And even though HP's IIIiS is still PCL champ in graphics with a rate of 3.8 gppm, the QMS-PS 1700 beat it in PostScript mode. PostScript printing was not affected by resolution; the PS 1700 consistently printed 1 gppm.

The PS 1700 handles text printing admirably. Again, there was little difference between 300- and 600-dpi modes, and the speed differences printing text files in PCL and PostScript emulations were negligible. No other shared printer can match the network features that the PS 1700 offers or beat its impressive (and consistent) 14.5-text-pages-per-minute output.

These network features include the PS 1700's more-than-adequate paper handling capabilities. In addition to two 500-page paper trays, the printer's output bin holds 500 pages and beeps when it is full. An automatic paper-jam recovery feature instructs the printer to automatically reprint jammed pages, which means no resending botched print jobs. And duplexing is also available for \$695. Font fans will appreciate the PS 1700's 45 resident PostScript fonts as well as



FACT FILE

QMS-PS 1700

QMS Inc., One Magnum Pass, P.O. Box 81250, Mobile, AL 36689-1250; 800-631-2692, 205-633-4300.

List Price: With 8MB RAM, \$8,995. 4MB SIMM, \$459, 1MB SIMM, \$149; Novell Ethernet, \$995; 40MB internal SCSI hard drive, \$795; 120MB internal SCSI hard drive, \$1,195. Additional paper trays, \$129 each; powered envelope feeder, \$495; duplex print option, \$695.

In Short: At \$8,995, the QMS-PS 1700 is not exactly a bargain compared with HP's IIIiS. But the PS 1700's network managing features and standard 600-dpi resolution are very impressive, and our tests show that it is a network printer that will work assiduously to earn its keep.

CIRCLE 424 ON READER SERVICE CARD

optional internal (40MB or 120MB) and external (20MB and 45MB) SCSI hard drives to provide extra storage for shared fonts.

All told and tested, the QMS-PS 1700 offers the right mix of features, Adobe PostScript support, and 600-dpi resolution for a 20-user network that demands printing flexibility, typeset-quality output, fast text printing, and quality graphics. This one earns its keep. ■



At speeds that beat most, the QMS-PS 1700 prints sharper gray-scales at 600 dpi (right) than at 300 dpi (left).



The QMS-PS 1700 prints smooth text at 600 dpi (right) at about the same 14-ppm rate as at 300 dpi (left).

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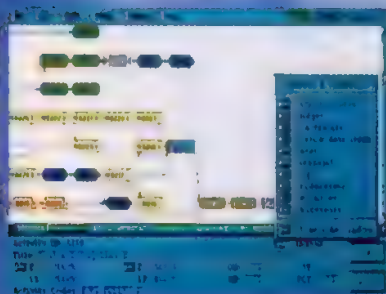
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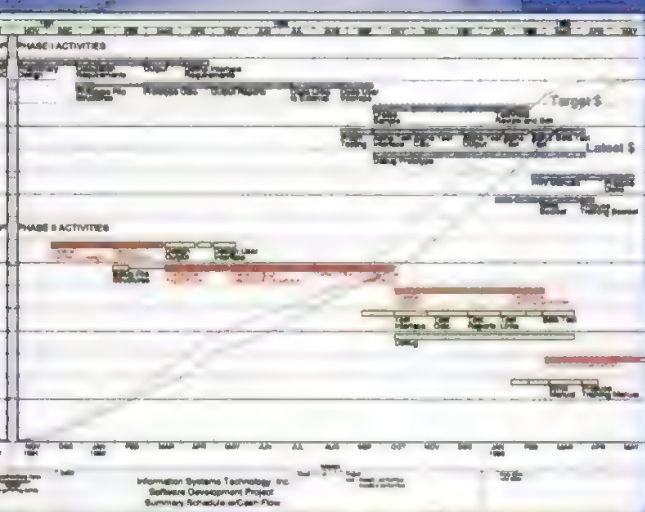
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LANTastic for NetWare: Connect More Users For Less Money

HANDS ON
by M. Keith Thompson

In the past, when you hit the user limit of your *NetWare* network, you had one choice: upgrade to the next level. Then, Novell introduced a peer-to-peer option for *NetWare* networks called *NetWare Lite*. But that option limits you to 25 users and costs \$200 to \$450 per node (when you include purchasing network adapters).

With *LANTastic for NetWare*, you can add peer-to-peer connectivity to your existing *NetWare* network for less money and face fewer limitations. Using *LANTastic*, up to 300 client PCs can share printers, disk drives, CD-ROMs, and tape backups with any other computer connected to the network. At \$499 per server, *LANTastic for NetWare* is a bargain in certain configurations.

Artisoft targets *LANTastic for NetWare* at small *NetWare* 2.2 networks that have reached their user limit. Instead of spending the extra money to upgrade to the next user level of *NetWare* (which can cost from \$400 to \$10,000), you can add *LANTastic for NetWare* for less than \$500. As long as your applications software is not limited to running only with *NetWare*, this option can be very attractive.

LANTastic for NetWare also allows you to experiment with peer-to-peer networking while still using your *NetWare* network. You may find you really don't need the power or administrative headaches of a *NetWare* network. So when it comes time to add users to your network, you may want to make the switch to a simpler, less expensive network operating system.

LANTastic for NetWare is a complete version of *LANTastic* that is designed to run over Novell's NetBIOS. It includes all of the features that make a top-notch peer-to-peer LAN, such as ease of use, excellent secu-

rity, simple administration, and speed. Since it runs on Novell's NetBIOS with your existing hardware and cabling, network users can be sharing peripherals in minutes. *LANTastic for NetWare* creates a directory on your hard disk and a batch file to load the *LANTastic* software. Once the software loads, you can communicate with both the *NetWare* and *LANTastic* networks. In our test configuration, we shared printers and files easily.

The one catch is that the program needs lots of memory. To make all of this work, you have to load Novell's NetBIOS (29K), then *LANTastic's* redirector (13K), and finally *LANTastic's* server program (26.5K) for a total of 68.5K.

A typical 386-based PC running DOS 5.0 with a VGA card and network adapter has only 79K of free upper memory after



LANTastic for NetWare can add users to existing *NetWare* networks. Here it displays printer port redirections to *LANTastic* and *NetWare* print queues.

loading DOS HIGH and in the upper memory blocks. Although you can load these programs HIGH with DOS 5 or other memory managers, in many cases this memory is fragmented and the largest single block of memory is 530K. It is this amount of RAM that determines the size of the largest program you can load.

LANTastic for NetWare offers *NetWare* users a smooth migration path to a peer-to-peer network. If you have software spe-

cific to *NetWare* and must have access to your *NetWare* resources, it's not for you. However, if you just want to add users and share printers, *LANTastic for NetWare* is simple and cost effective. ■

List Price: *LANTastic for NetWare*, \$449 per network.
Requires: Novell *NetWare* 2.x or 3.x, Novell's NetBIOS, 42K RAM on client PC, 68K on server. Artisoft Inc., 691 East River Rd., Tucson, AZ 85704; 800-846-9726, 602-293-6363.

CIRCLE 421 ON READER SERVICE CARD

New MS Mouse Driver Features Large Cursor

HANDS ON
by Barry Simon

If the mouse cursor on your laptop sometimes drives you up a wall, then you'll want the newest upgrade to the Microsoft Mouse driver, Version 8.1. It's the upgrade that all Microsoft Mouse owners, especially laptop users, will welcome.

Most important is its option to increase cursor size. In DOS text mode, you can increase the size to a five-block crossbar or to

an eight-block hollow rectangle. Under Windows, you can increase the linear dimensions of the mouse cursor by a factor of either 2 or 1.5. On a regular VGA monitor at 640-by-480 resolution, the large DOS cursor held no interest, but at the 800-by-600 resolution of a Super VGA display, the large mouse cursor was surely appreciated.

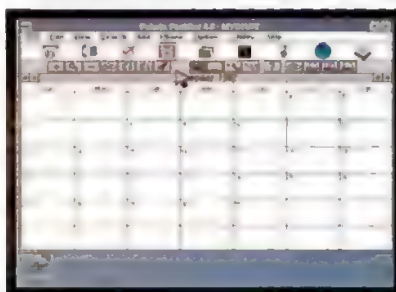
Unlike the large cursor you get with Abacus's *NoMouse* or Moon Valley's *IconDoit*, which enlarge only the normal arrow cursor in Windows, the

Microsoft Mouse cursor also enlarges other system cursors, such as the double-headed arrow and the text I-beam. You can also set the enlarged cursor to shrink back to normal size when the mouse isn't moved for some time.

The new driver can be loaded in UMB, HMA, or EMS memory, a feature that was unreliable in Version 8.0. I successfully loaded the 8.1 driver to take only 5K of UMB, with the rest tucked into HMA space left free by DOS 5. While most hardware driver upgrades produce yawns, the new Microsoft Mouse driver is one upgrade to get excited about. ■

List Price: *Microsoft Mouse Software*, Version 8.1. Free to Ballpoint Mouse owners and Microsoft Mouse, Version 8.0, users; upgrade fee to owners of earlier mouse drivers, \$25.
Requires: Microsoft Mouse. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080.

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The new Microsoft Mouse driver can make the mouse cursor larger. It can also make it transparent so text shows through. Laptop users will welcome the large I-beam and crossbar.

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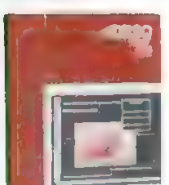
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First Looks

Psion's New Palmtop Improves on Design, Adds Multitasking Software



Psion's Organizer was the first widely available palmtop computer, but its tiny screen and alphabetically organized keyboard rendered it unsuitable for most mainstream applications. The Organizer had some great strengths, however, such as its simple-to-grasp interface, proprietary data storage cartridges, and built-in programming language. Now, Psion has integrated many of these strengths into a new machine, the Series 3, which has a much improved keyboard, a larger screen, and a brace of useful software applications. At \$549 for a system with 256K of internal system RAM, the Series 3 should provide formidable competition for leading palmtops such as the Hewlett-Packard HP 95LX and the Sharp Wizard.

The NEC V30H-driven (80C86 compatible) Series 3 measures just 0.9 by 6.5 by 3.4 inches (HWD), and its clamshell-style case slides easily into most pants or jacket pockets. It runs

on two AA batteries and a lithium backup battery that Psion supplies.

The 66-key keyboard is laid out in traditional QWERTY fashion with a row of special icon-shaped keys across the top that launch the Series 3's built-in applications, which include a simple database manager, a word processor, a calendar/scheduler, a clock, a world map, a calculator, and Psion's OPL programming language. The Series 3's proprietary ROM-based operating system supports multitasking, so you can jump back and forth among applications.

As with most other palmtops, touch-typing on the Series 3 is a difficult proposition. That's partly because palmtops in general are simply not big enough to accommodate adult hands, and partly because the key action on the Series 3's keyboard is a little stiff. Also, you must press directly over the center to register a keystroke. Tapping a corner of a particular key usually fails to register a keystroke. Nevertheless, the keyboard is a vast improvement over the Organizer's calculator-like keypad, and fairly fluent touch-typing is possible with practice.

The screen measures 3.8 inches long by 1.5 inches high and displays up to 8 lines of up to 40 characters each. Unfortunately, the case design allows for only a single, preset viewing angle that locks into position, so you're forced to adjust your position relative to the screen in order to achieve the best viewing angle. A multiposition hinge for the screen would definitely be a big improvement.

The Series 3 supports proprietary memory modules (incompatible with the Organizer) that slide into the two "drive" bays located on the back of the system case. The operating system addresses the memory cards as if they are standard drives, assigning a drive letter to each



The \$549 Series 3 palmtop weighs under three-quarters of a pound and comes with seven built-in applications, including a word processor, contact list, and scheduler. An optional serial link drives an external modem and allows file transfer.

bay. The internal RAM disk is designated as drive C:, much like a PC's internal hard disk.

Smaller and slightly thicker than the "credit card" storage modules used by the Atari Portfolio and the HP 95LX, these solid-state disk substitutes are available as battery-backed RAM or flash memory in densities up to 2MB. The flash cartridges are less expensive but must be reformatted before deleted data can be overwritten.

SEVEN MULTITASKING APPS

While the Series 3 is not a DOS-compatible machine, its built-in applications—especially the word processor—are designed to work smoothly with desktop applications. A tap of the leftmost icon-key brings up a system menu with on-screen icons that represent each of the internal apps. You can launch an app either from this menu or from the icon keys.

Psion's Word application is far and away the most sophisticated word processor yet available for a palmtop. It reads and writes *Microsoft Word* files and supports a startling range of its functions, including limited stylesheets as well as text attributes such as boldface, superscript and subscript, underlining, and italics. Better still, these attributes are displayed, in WYSIWYG fashion, on-screen. A "menu" key invokes a pull-down menu bar of program functions, and a "help" key brings up on-line help in all the apps.

The database comes with a

preinstalled file that tracks names, addresses, and phone numbers, and you can easily define your own template, including a memo field. To enter appointments on the scheduler, just highlight a date and hit enter to reveal an hourly schedule for the day. A great help to the business traveler, the Time function supports four alarms and the World function displays the current time in over 400 cities.

Psion's calculator offers a rich assortment of functions and displays a paperless tape of recent calculations. Perhaps its most powerful feature is its integration with OPL, Psion's programming language. You can develop OPL procedures that return a number to be used with the calculator. You can also pass values from the calculator to parameters in OPL procedures.

An optional serial link allows the Series 3 to drive an external modem, and the included software allows file transfer. A communications package installs as an icon in the main menu screen and supports a very sophisticated script facility.

With an improved keyboard and a more adjustable screen, the Series 3 would clearly be the new leader in the palmtop field. While it doesn't have the HP's slick *Lotus 1-2-3* implementation or the Wizard's incredible array of peripherals, its basic power and flexibility place it near the head of the class. Power users will appreciate its PC-like functionality and carefully thought-out software. ■



FACT FILE

Psion Series 3

Psion Inc., 118 Echo Lake Rd., Watertown, CT 06795; 800-628-7949, 203-274-7521.

List Price: With 256K RAM, \$495.95; with 128K RAM, \$449.95. Flash memory storage modules: 128K, \$95.95; 256K, \$145.95; 512K, \$245.95; 1MB, \$395.95; 2MB, \$695. RAM storage modules: 128K, \$149.95; 512K, \$395.95; 1MB, \$495. Serial cable and accompanying software, \$149.95; modem cable, \$25.

In Short: Psion's new palmtop, the Series 3, is a vast improvement over the dated Organizer. A compact case and excellent internal software are slightly offset by a less-than-ideal keyboard and a nonadjustable screen hinge.

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386 SX Systems
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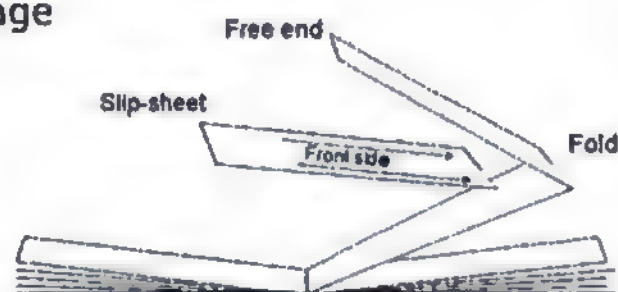
decisive victory for the Midwestern firm customers call the "cow company."

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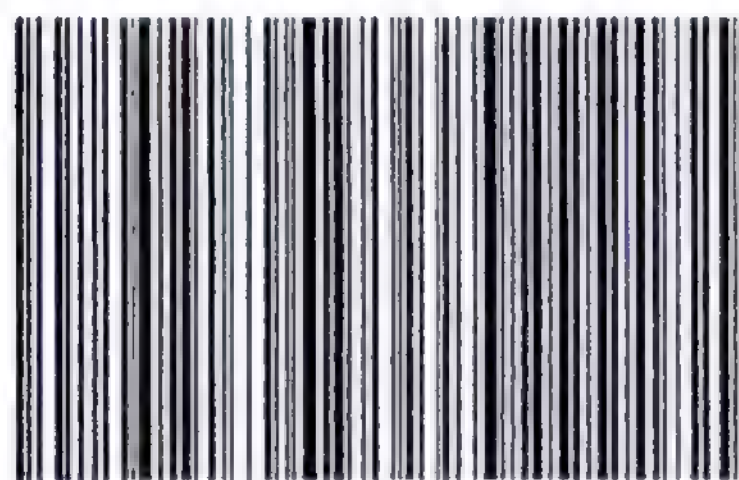
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employees from departments throughout the company.

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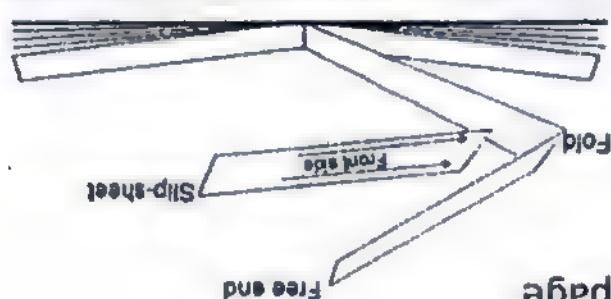


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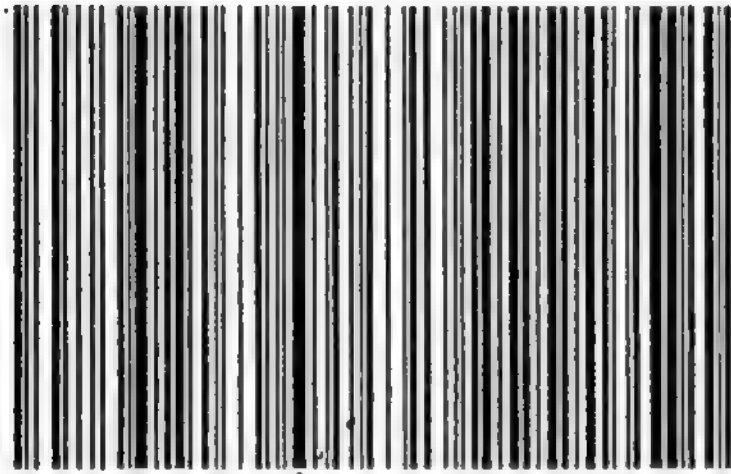
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Inverted Back



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Back

1. Follow instructions on the other side



286 Systems
GATEWAY 2000 286/16



For the first time in the six-year history of *Computer Shopper* magazine's Best Buy competition, one company swept all of the awards in the desktop PC categories. At COMDEX/Fall '91 in Las Vegas, Gateway 2000 was awarded Best Buy honors for 286, 386SX, 386 and 486 desktop computer systems.

Our thanks to Gateway's own Semi-Gold Dancers played by employees.

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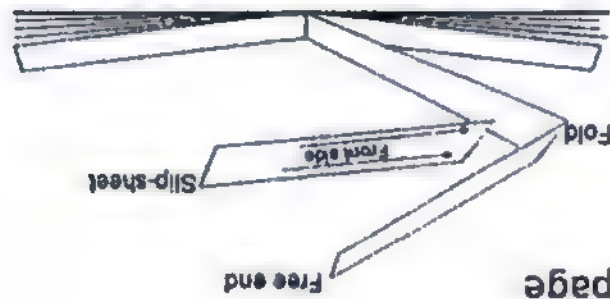
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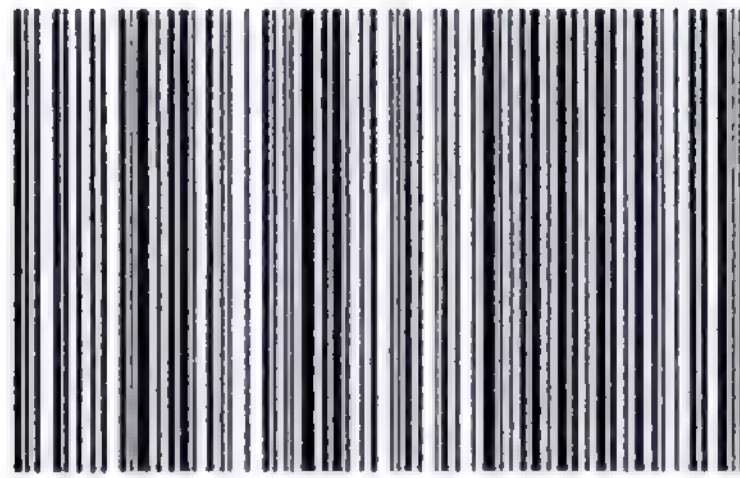
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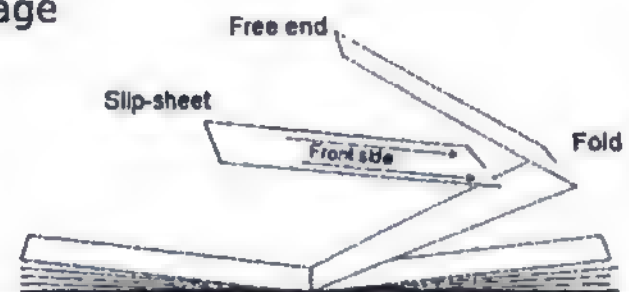


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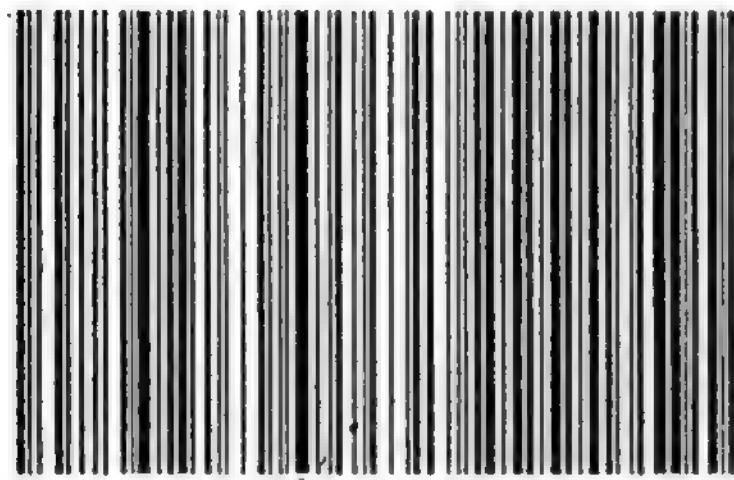
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IT'S A CLEAN SWEEP



386 Systems
GATEWAY 2000 386/33C



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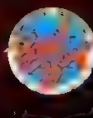
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Personal Information Manager Lets You Have it Your Way



Personal information programs have a tough challenge: choosing the right mix of features and balancing the ease of preformatted information files with the power of customization. *YourWay*, Version 2.0 (\$199), Prisma Software Corp.'s personal and business organizer for Windows 3.0, clearly favors the customizers—those who want to control data and report formats.

YourWay's major components include a cardfile, task manager, calendar, call manager with phone dialer, and report generator. It runs as a standalone program but can also be invoked quickly from other Windows programs via a "Quick Menu" title bar icon. A network version of the program is due to market this spring.

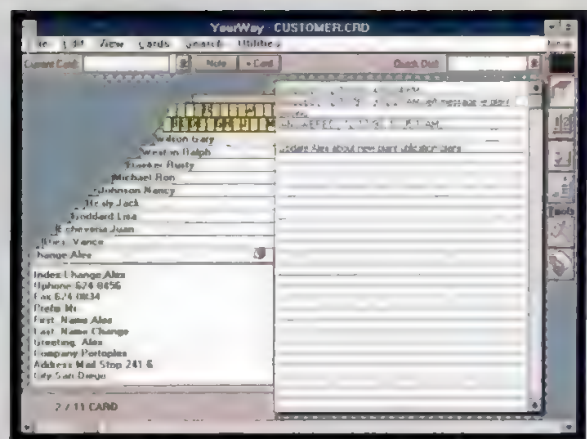
The cardfile is the central part of the program, with the other modules sharing data stored on cards. The two templates included with the program are for storing contact names, but you can use cardfiles to organize any type of data. Within an on-screen representation of a Rolodex-style three-dimensional file, you determine the fields to be included in each cardfile, up to 100 per file. Other physical limitations include 5,000 cards and three index files per cardfile. Each card can have an attached note up to 10K in length (approximately 2,000 words).

Defining a cardfile is reminiscent of defining files in simple database programs. For example, field names cannot contain spaces. To add data, you can enter it directly on the card or use a more attractive data-entry screen. The program stores information for each card on one scrollable page.

Unlike many simple filing programs, *YourWay* makes it easy to change cardfile formats. Adding

or deleting fields is very simple—perhaps too simple, since a single confirmation prompt is all that prevents anyone from deleting fields. You can change the on-screen card size at any time via Windows' cursor-sizing techniques.

To use *YourWay*'s calendar and call manager you can either make entries directly in a notebook-style screen or access information stored on cards. The default daily calendar view lists appointments on the right side of the notebook and the current day's calls on the left. You can also switch to weekly or monthly views of events, tasks, or calls. When



The core application of Prisma Software's *YourWay* 2.0 is its Rolodex-style free-form cardfile. All other program components—calendar, call list, task list, and reports generator—call on data stored on *YourWay*'s cards. Attached notes of up to 10K can hold text entries.

you use the included autodialer, call history entries are automatically added to the cardfile of the individual contacted.

You can assign visual and audio alarms to events, and attach notes to them. *YourWay* in-

cludes options for daily, weekly, and monthly recurring events or appointments and lets you define holidays or special days, such as employee birthdays.

You can set up your own

CONTINUED ON PAGE 50

Way You Work Organizes DOS Desktops

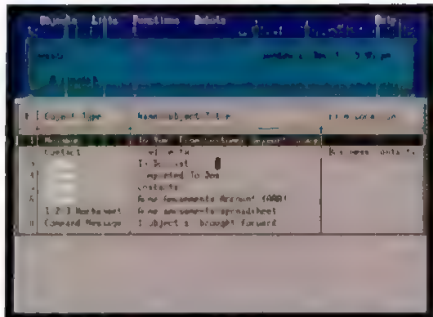


Have you noticed that nobody makes DOS shells anymore? They're called desktops now, and they combine application launching with dozens of other PIM-like features such as appointment books, macro languages, and phone dialers. This trend hasn't missed Proteo, publishers of *Way You Work* (\$399), a shell that adds so many features you may never launch any programs from it.

Like other desktop programs,

Way You Work can launch an application and a file, but it does much more. In fact, it's a file database that keeps track of who authored a file, when it was last modified, keywords, and action dates that can trigger an alarm reminding you to take a look at a file at a prespecified time.

Way You Work does its best to insulate you from DOS by calling files "objects," giving them filenames up to 35 characters long, storing these objects in folders, and keeping a wastebasket of deleted objects. A single application can create several types of objects. For example,



Way You Work's desktop is the repository for folders and objects (loosely akin to directories and files) where you can also access many PIM-like features.

budgets and lists could be two types of Lotus 1-2-3 objects. When you create a new budget object, *Way You Work* loads Lotus 1-2-3 and calls up a budget template. If you create a list object, a different template will be used.

The program's Integrate procedure automatically sets up most popular applications to run from *Way You Work*. You can then organize and sort your files based on their content, author, date, or priority. From there it takes just a single keystroke to load the file into the application that created it.

If you use *Way You Work* religiously, you'll quickly build a database of files that reflects the organization of your work and your personal style, not the structure of your hard disk. If you're a neat freak, you might want to keep all of your files in folders. Less compulsive users can leave files scattered around their desktops; a convenient Refile command returns files left on the desktop to their folders.

Way You Work's time-management features are somewhat primitive. The calendar can only

CONTINUED ON PAGE 50

First Looks

YourWay

CONTINUED FROM PAGE 49

calendar report format or use *YourWay's* predesigned formats. For *Day-Timer* or *Franklin Day Planner* users, *YourWay* prints daily views on preprinted planner sheets. The standard *YourWay* daily calendar report prints the calendar and call lists as well as the day's task list.

YourWay's task manager has two levels—Master Tasks and Tasks for Today—with 100- and 20-task limits, respectively. Once you enter tasks on the master list, the program automatically moves them to the daily list when due dates come up; you can also transfer tasks manually. Uncompleted tasks roll over to the next day, and overdue tasks are displayed in red. The task lists are displayed in an on-screen notebook. You can attach notes to tasks and sort the tasks by category, due date, priority, or by

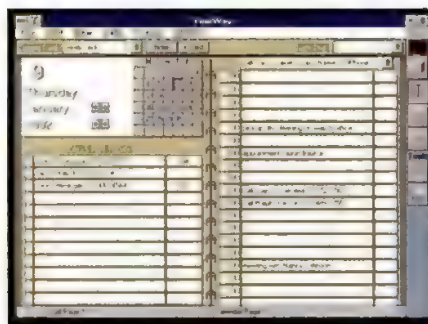
the people involved.

The report generator creates column-oriented reports similar to spreadsheets. Several report templates are included, and you can easily set up your own. A totaling function lets you add numeric entries in columns or rows.

YourWay supports Windows dynamic data exchange, which is especially helpful for transferring information stored in *YourWay* files into a Windows word processor. It also imports and exports several common file formats.

YourWay's biggest improvements from Version 1.1 are in its graphical presentation. The calendar has been redesigned to resemble commercial notebooks and its print features have been enhanced.

Every personal utility program makes some compromises. *YourWay* doesn't have the sophisticated call-tracking and sales-oriented features found in dedicated contact managers like Contact Software International's



YourWay's calendar view shows calls on the left page and scheduled events on the right page of a simulated notebook.

ACT or Richmond Technologies & Software's *The Maximizer*. It lacks the sheer programming power of IBM *Current for Windows* and the long list of features of Polaris Software's *PackRat*. On the other hand, the cardfile orientation adds a free-form filing function that Okna Corp.'s *The DeskTop Set* lacks, and its contact management feature and phone dialer give it an advantage over Campbell Service's *OnTime for Windows*.

In the end, the best personal utility program for you depends on your preferences and working styles. If you want the control

YourWay offers and you're willing to expend the effort to tailor the program to your needs, *YourWay* can be a fine personal management program. ■

List Price: *YourWay*, Version 2.0, \$199; upgrade from prior versions, \$49; introductory price until March 1, \$69. **Requires:** 2MB RAM, 2.3MB hard disk space, DOS 3.1 or later, Windows 3.0 or later, mouse. Hayes-compatible modem required for autodialer feature. Prisma Software Corp., 2301 Clay St., Cedar Falls, IO 50613; 800-373-0241, 319-266-7141.

CIRCLE 428 ON READER SERVICE CARD

Way You Work

CONTINUED FROM PAGE 49

schedule appointments in half-hour increments, and scheduling daily, weekly, or monthly events is a frustrating process of creating an appointment, deleting that appointment, and then undeleting it for each instance. However, you can use *WYW's*

Robot macro feature to automate this process.

Although *Way You Work* lacks the extensive customization and data-handling capabilities of full-fledged PIMs such as *Agenda* or *AskSam*, the program nonetheless makes a good repository for notes and contact lists. Searching, sorting, and reporting are all supported. Unfortunately, you have

to stick pretty close to one of seven examples provided for creating a new database. You can change labels and remove fields, but you can't change the physical layout of the form used to enter data or summarize a record. Proteo says this capability will be available in a forthcoming toolkit.

If you use *Way You Work* on a Novell network, you can communicate with other *WYW* users through the program's e-mail function. E-mail messages also take the form of desktop objects with files or data behind them. Descriptive notes and multiple users are handled by a cover sheet and the recipient is immediately notified by a message on all *WYW* screens.

One thing *Way You Work* cannot do is pop up the desktop over your applications, a la *DESQview*. That's a serious oversight, since *Way You Work* stores your files under cryptic DOS filenames (this review was called 000023G.DOC) unless you specify otherwise. In other words, using *Way You Work* is the only practical way to find files created by applications running under it. If you decide you want to

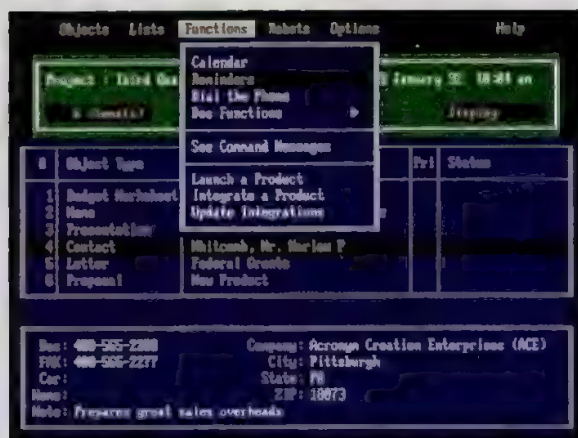
import a spreadsheet into a document, you may find the spreadsheet impossible to locate.

TSR operation would also make it possible for *Way You Work* to notify you of e-mail while you were using an application. Other drawbacks include the use of 5.5MB of disk space, the creation of 43 directories, and having anywhere from 40 to 80K less memory available for your applications (about half that if you use EMS).

Way You Work can only be successful if you work with it, not against it, and unlearn everything you know about DOS. Take a short cut by copying a file at the C> prompt and you'll mess up the whole system. Once you start using *Way You Work*, you've got to stick with it. If you do, this program could change the way you work. ■

List Price: *Way You Work*, Version 2.01, \$399. **Requires:** 286-based PC or better, 640K RAM, 3.5MB hard disk space, DOS 3.1 or later. Proteo Technology Corp., 210 Carnegie Center, #101, Princeton, NJ 08540; 800-668-6716, 416-479-2000.

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A detail window in *Way You Work* can display contact information; the pull-down menu reveals the auto-dialer function. You can give all files and documents meaningful filenames up to 35 characters long.

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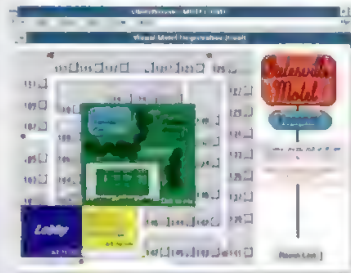
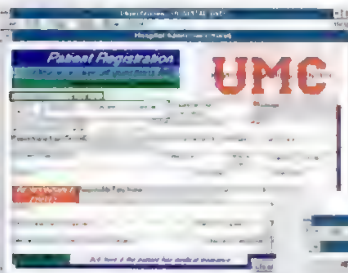
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First Looks

MailMan Delivers with MHS and Windows Support

HANDS ON
By Terry Pomplun

Reach Software Corp.'s *MailMan for NetWare MHS* gives Windows 3.0 users a powerful electronic mail program that supports Novell's *MHS* (Message Handling Service). The *MHS* standardized transport, directory, and message format specification, which lets disparate e-mail systems work seamlessly with one another, lets *MailMan* exchange messages with other native *MHS* e-mail systems such as Da Vinci System Corp.'s *Da Vinci eMail*. *MailMan*'s support for Windows' dynamic data exchange (DDE) also lets you send messages from other applications, such as *Word for Windows*.

MailMan helps pave the way for Reach's forthcoming forms-based network workflow application, called *WorkMan*. *WorkMan*, due this March, will automatically route messages through a predefined path of recipients instead of leaving it up to the user to determine the distribution. You could set up a *WorkMan* requisition form to go from the requester to his manager for approval and then off to the purchasing agent for her sign-off.

MailMan offers all the typical electronic mail capabilities,

such as creating, sending, and replying to messages as well as the ability to attach spreadsheets, formatted documents, and graphics to messages. Assembling a message is a multiwindow process, starting in the Compose window. The Envelope window lets you address the message by typing in the name, selecting it from a pick list, or creating your own Address Books. Address Books can include distribution lists as well as synonyms for actual names; for example, "Bob" could be a synonym for the address "Robert@LABSMHS."

Some other e-mail systems are a bit more intuitive, putting all the message elements—addressing, attachment, and composition—on one screen. With *MailMan*, you may feel like you're piecing a message together like a puzzle without getting to see the big picture. The various windows can also clutter the screen; the Navigator toolbar helps by letting you select an icon to bring the desired window to the front.

MailMan offers several delivery options: Answer replies to the original message and sends the reply to the original sender, while Forward sends a copy of the message to a new recipient. When you want to answer a message but include the original

text, a feature called Notify includes the original message.

As with other *MHS* applications, *MailMan* messages can contain only ASCII text, with carriage returns at the end of each line. E-mail systems that are not tied to *MHS*, like the one in *Lotus Notes*, can embed formatted text and graphics in the message. *MailMan*'s Attachment feature lets you get around *MHS*'s ASCII-only restriction. You can attach non-ASCII documents, spreadsheets, programs, or graphics to each message.

MailMan does a pretty good job of exploiting the Windows interface. For example, Address Books, normally menu bar items, can be minimized and placed within the *MailMan* window. This can help you get to addresses more quickly, especially when you begin working with the program and aren't sure where to find all of the commands.

Although generally adherent to Windows standards, *MailMan* deviates in a couple of basic places. The most annoying is the Cut command, which is grayed out in the Edit menu when you are removing a message. Instead, Reach uses the Delete command under the Message menu.

MailMan comes with a single host version of Novell's *NetWare MHS 1.5* to create the *MHS* directory structure on your server. In a basic single-server configuration, you can install *MHS* and *MailMan* on the network server, add users with Novell's Directory Manager, and be ready to send and receive mail. In more complex multiserver WAN environments, you'll need to install *MHS* routing, hub, and gateway hosts to push mail around several servers on the network.

In our testing, *MHS* installed fairly easily but needed some cleanup before it would work with *MailMan*. For example, the *MHS* public subdirectory installed with limited access rights and had to be reassigned with full rights. There was also a discrepancy between the way the Master Volume DOS environment variable is assigned by Novell and read by *MailMan*. *MailMan* gives you the option of an automatic log-on by placing your username and password in the MAILMAN.INI file. You are also



FACT FILE

MailMan for NetWare MHS
Reach Software Corp., 872
Hermosa Dr., Sunnyvale, CA
94086; 800-624-5356, 408-
733-8685.

List Price: 5-user license,
\$349; 25-user license, \$995;
unlimited-user license, \$2,295

Requires: 2MB RAM, DOS
3.1 or later, Windows 3.0,
NetWare 2.1x or 3.1x server.

In Short: An *MHS*-based
e-mail package that makes
good use of the Windows
interface. *MailMan* delivers
basic e-mail features, including
private Address Books. Its
major shortcoming is *MHS*'s
limitation to ASCII-only
messages.

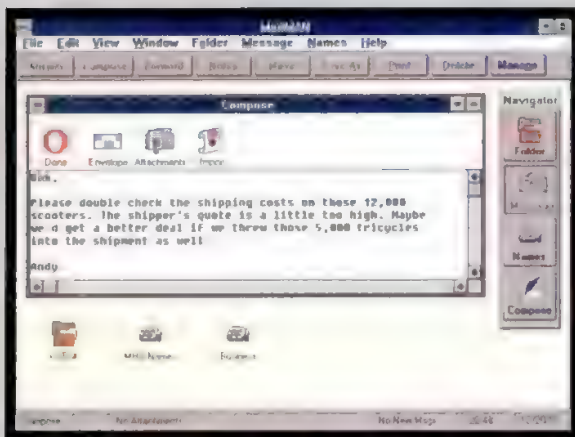
CIRCLE 430 ON READER SERVICE CARD

given access to any mailbox to which you have been assigned *NetWare* rights.

Most of *MailMan*'s administration chores are handled through Novell's Directory Manager. Reach includes basic program preferences for startup options. A nice addition would be a preference editor for creating the initial parameters for a given installation that users could modify later.

MailMan's instant compatibility with other *MHS* applications is a productivity boon. Within minutes of setting up *MailMan*, we could exchange messages with the *MHS* e-mail system in Software Publishing Corp.'s *Just-Write*. If you prefer to send messages from *Microsoft Word for Windows*, you can access *MailMan* through a WordBASIC macro that uses DDE. And if you receive an *Excel* spreadsheet, for example, *MailMan* can launch *Excel* from within *MailMan* to view the document. The company says it plans to incorporate object linking and embedding (OLE) in future versions.

MailMan's strength is its exploitation of the Windows interface while remaining true to the *MHS* spec. Reach bet the farm on *MHS* by offering only true *MHS* e-mail; its competitors, such as *cc:Mail*, include both *MHS* and proprietary versions. If Windows is your e-mail environment, and you would benefit from smooth interconnection with other *MHS* e-mail packages, *MailMan* is a good solution. ■



MailMan lets you create custom address books and minimize them as icons on your desktop.

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WinSleuth Professional: Windows Reporting Utility Sniffs Out the Facts

HANDS ON
by Barry Cramer

A popular class of DOS-based utilities, led by Quarterdeck's *Manifest* and Merrill & Bryan's *InfoSpotter*, provides a combination of system reporting, setup, and limited diagnostics. Until now, the only Windows-based choice was Dariana Inc.'s *WinSleuth* 1.0, a program with an attractive look but limited capabilities. With the release of the \$169 *WinSleuth Professional* 2.0, Dariana has produced the first serious Windows reporting utility.

This is not a mere upgrade or rewrite of the original *WinSleuth* but a totally new program, licensed from Omega Logic. Within an elegant Windows interface, *WinSleuth* now provides considerable information about your system including reports on RAM, disk drives, CMOS, ports, device drivers, memory usage, open files, and networks. Its ability to uncover some of this material is an impressive feat, because Windows tries to insulate users from certain system information.

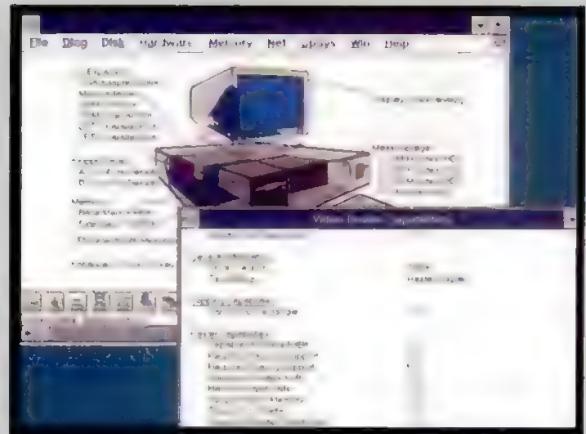
WinSleuth Professional provides considerable Windows-specific information, such as

detailed descriptions of the screen and printer drivers. It also makes interesting use of Windows' multitasking capabilities. For example, you can place a list of open files or a report on RAM usage in a window and see it updated dynamically as you run other programs.

One aspect of the program deserves particular mention. Called the Installation Assistant, this feature does its best to determine which DMA channels, IRQs, and I/O ports are in use. The I/O port reading is unique. Since the Installation Assistant only reads the ports (writing to a random port could cause havoc!), the search won't be perfect, but when it comes to installing a new board, the information it provides can be invaluable.

WinSleuth Professional includes diagnostics for mouse, comm ports, RAM, video, CPU, and low-level disk problems. Special controls and reports are available for Smartdrv users. A copy of Abacus' *Virus Secure for Windows* is bundled with the package.

The interface is pleasant, with icons at the bottom of the main window to invoke most func-



WinSleuth's main window includes a push-button interface and lets you post subsidiary information in side windows. You can even display a report on RAM usage as you run other software.

tions. A nice touch is a button that lets you keep any report displayed in an on-screen window during your *WinSleuth* session. While you can print reports, you cannot easily save them to an ASCII file or the Clipboard.

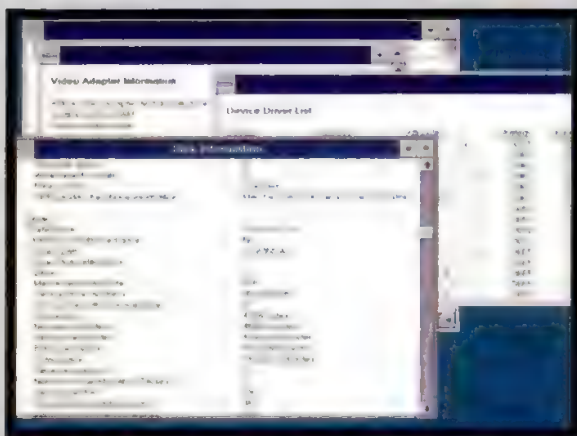
The program has a couple of glitches. Running the Installation Assistant caused my mouse to freeze up. When I ran the disk utilization report on one drive, the program insisted that a directory containing 46MB of files on a 199MB drive represented only 1.9 percent of the drive instead

of 23 percent.

Anyone in the market for a reporting and setup utility should consider *WinSleuth Professional* seriously. And if you want one that works under Windows, right now *WinSleuth* is the only game in town.

List Price: *WinSleuth Professional*, Version 2.0, \$169.
Requires: Windows 3.0 in standard or enhanced mode. Dariana Inc., 7439 LaPalma Ave., #278, Buena Park, CA 90620; 800-892-9950, 714-562-5777.

CIRCLE 419 ON READER SERVICE CARD



WinSleuth's reporting capability includes video, disk, and system-level information. It also helps find available DMA channels, IRQs, and I/O ports.

Font Sets from Monotype And Adobe Offer Type And Typographic Advice

HANDS ON
by Edward Mendelson

Anyone can sell you printer fonts, but it takes experience and expertise to help you learn to select the ones you need and use them effectively. Two new series of font packages from Monotype Typography and Adobe Systems contain PostScript Type 1 fonts chosen for their suitability to specific printing tasks such as memos, forms, presentations, or awards. Each package includes manuals that show you how to make the fonts work at their best in your documents.

The three *Monotype Desktop Solutions* packages, \$179 each,

give you fonts that enhance standard corporate design tasks—reports, forms, catalogs, newsletters, and booklets. Adobe's four latest *Adobe Type Set* packages, \$149 each, offer fonts and advice for smaller-scale work such as invitations, memos, faxes, and spreadsheets. Both include fonts suitable for presentations.

Each Monotype package includes two full typeface families, chosen to complement each other on the page, and a PostScript font installer (written by Adobe) for use with Windows, *WordPerfect*, *Microsoft Word*, and *Ventura Publisher*. Each Monotype package also includes

CONTINUES ON PAGE 56

20 lb. copy paper



80 lb. text



60 lb. marbled paper



60 lb. text

It can take any paper you feed it.

80 lb. cover



24 lb. bond



20 lb. yellow pages paper



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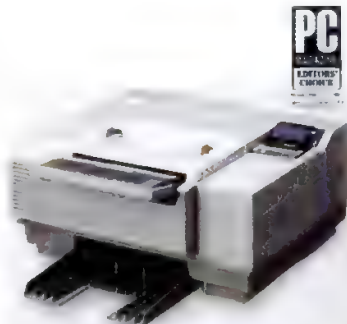
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Tektronix
The best and the brightest.



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CIRCLE 001 ON READER SERVICE CARD

First Looks

Monotype and Adobe Font Sets

CONTINUED FROM PAGE 54

the Adobe-written *Font Foundry* utility, which generates bitmap soft fonts for LaserJet-compatible printers.

Adobe's packages, in contrast, come with *Adobe Type Manager*, which lets you use the fonts with any Windows-supported printer; however, Adobe doesn't include the separate installer and *Font Foundry*. (You get them with any of Adobe's standard font packages.) *ATM*, of course, works with the fonts in the Monotype packages, and you can use the installer and *Font Foundry* that you get from Monotype with any fonts in the Adobe packages.

MONOTYPE: A FONT FOR EVERY OCCASION

The three Monotype packages offer superb type designs and a wealth of information. Each contains two full typeface families, one serif and one sans serif, and five booklets: a general introduction to desktop publishing, a professionally thorough guide to preparing the kinds of documents that the package was designed for, an installation

Adobe Business Type Sets include an economical variety of text fonts and symbol sets.

manual, and detailed histories and sample sheets for the two typeface families. Monotype is the only foundry brave enough to include samples of 300-dot-per-inch output, and no other fonts for the PC come with such realistic and extensive documentation.

The fonts in Monotype's packages are among the first in Monotype's rerelease of its entire Type 1 font library. The new versions include extensive kerning pairs and use filenames that eliminate inconveniences when installing the fonts with *ATM*.

Monotype's *Designing Reports and Presentations* includes four weights of Photina, one of the first and most elegant faces designed for nonmetal typography, and four standard and one condensed weight of News Gothic, a sans serif face ideal for slides. *Designing Forms and Catalogues* includes Amasis, a new Monotype serif design that survives low-resolution and high-speed printing, and eight weights of Arial, a face that resembles Helvetica but with a livelier and less geometric design.

The bargain among the Monotype packages, *Designing Newsletters and Booklets*, contains four weights of Plantin (the face that evolved into Times Roman), plus the matching Expert Set with true small capitals, "lowercase" numerals, and other special characters. You also get four weights of Abadi Condensed, a stylish, narrow sans serif face. Monotype sells the normal-width version of Abadi in one of its separate typeface packages.

Abadi Condensed Light Extra Bold
Plantin Italic Bold SMALL CAPS
Arial Light Condensed Black
Amasis Italic Bold Bold Italic
Photina Italic Bold Bold Italic
Monotype News Gothic Condensed

All of these fonts reflect Monotype's characteristic simplicity, elegance, and strength. And the documentation treats Monotype's users with the same seriousness that foundries gave to their professional customers back in hot-metal days.

Some of the faces that come with *Monotype Desktop Solutions*. Note the true small capitals, which have different proportions than ordinary capitals.

ADOBE: FONTS FOR LESS

Adobe's four \$149 *Business Type Set* packages have a more varied (but also more miscellaneous) range of typefaces. Each package includes the same two booklets: a guide to the type in all four packages and an *ATM* installation manual. The type guide includes useful design tips and examples, but its few lines of description for each typeface are impressionistic and sometimes misleading. The booklet implies, for example, that Fette Fraktur resembles the calligraphy of medieval monks—but the design obviously dates from the nineteenth century.

Adobe's choice of typefaces is generally excellent. The eight faces in the most varied package, *Invitations and Awards*, include the ultramodern Arcadia, a script face, a face in old German style, a "Copperplate" face for traditional business cards, two weights of the witty Cochin, the Adobe-designed Charlemagne all-capital face, plus a font containing only map symbols.

Adobe's *Letters, Memos & Faxes* package contains four weights of ITC Berkeley Oldstyle, a slightly fussy serif design, and six fonts that remain legible in low-resolution output—four weights of Glypha and two of Lucida Sans. The *Spreadsheets & Graphs* package consists mostly of narrow faces: four weights of ITC Cheltenham Condensed and two of Trade Gothic Condensed, plus two standard-width weights of Frutiger, the elegant face originally designed for the signs in

the Paris Airport.

The *Overheads & Slides* package has four weights of Formata, a highly legible and lively sans serif design, three weights of ITC Stone Serif Semibold, the popular Tekton Bold (based on lettering in architectural drawings), and a symbol and icon font, ITC Zapf Dingbats. The package is, on the whole, more vigorous than Monotype's corresponding *Design Reports and Presentations* package. You can get additional weights of most of the typefaces in the *Adobe Type Set* by buying Adobe's standard soft font packages.

All these sets are more economical than standard packages from Monotype and Adobe. Each offers advice that will prove useful to every beginner and many experts. Beginners who want to become experts can get the best possible start from Monotype's packages. ■

List Price: *Monotype Desktop Solutions*, \$179 each.

Requires: PostScript or HP-compatible printer. Monotype Typography Inc., 53 West Jackson Blvd., #504, Chicago, IL 60604; 800-666-6897, 312-855-1440.

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List Price: *Adobe Business Type Sets*, \$149 each.

Requires: Microsoft Windows 3.0; and any Windows-supported printer. Adobe Systems Inc., 1098 Alta Ave., P.O. Box 7900, Mountain View, CA 94039-7900; 800-833-6687, 415-961-4400.

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Arcadia CHARLEMAGNE
COPPERPLATE GOTHIC Cochin
Snell Roundhand Fette Fraktur
ITC Berkley OldStyle Tekton Bold
Glypha Bold Glypha Light
Lucida Sans Frutiger 55
ITC Cheltenham Condensed Book
Trade Gothic Condensed Formata
ITC Stone Serif Semibold



Ambulance Car Virus. Ambulance randomly moves across bottom of display.



Friday 13th Virus. Alias "Black Friday." Erases programs when you try to run them.



Disk Killer Virus. Alias "Ogre." Causes unexpected formatting of your hard disk.



Stoned Virus. Alias "Hawaii." Data loss caused by damage to directory and FAT.



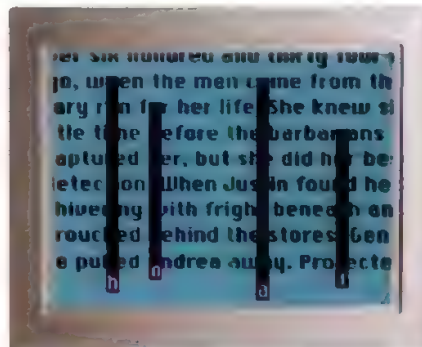
Datacrime Virus. Adds garbage to files and reformats disk.



AirCop Virus. Alias "Red State." Attacks boot sector on non-write-protected diskettes.



Ping Pong Virus. Alias "Bouncing Ball." Wipes characters off the screen.



Falling Letters Virus. Characters fall to the bottom of the monitor. Creative, but a real nuisance.



With over 50 new viruses each month, who knows what's next.

You Could Get By Without An Anti-Virus Program. Then Again, So Could These.

These days, with networks, modems, laptops, and more and more people sharing files, it's only a matter of time before a virus attacks your data.

To make sure you get them before they get you, you need Central Point Anti-Virus™. The only anti-virus program with File Immunization that protects your files so they can never be infected again. Central Point Anti-Virus detects over 800 viruses and destroys twice as many viruses as other programs. It'll even protect you from unknown viruses by searching for suspicious behavior.

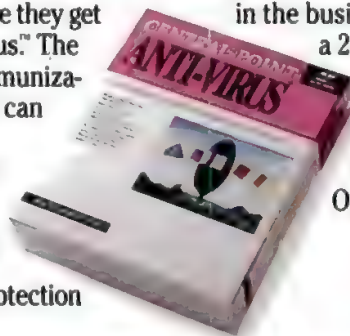
It's also the best anti-virus program for protection

inside Windows, and it works great across your Novell network.

And since there are about 50 new viruses popping up every month, we give you the most comprehensive support in the business. Including a free update, quarterly mailings, a 24-hour hotline with FaxBack, and BBS and CompuServe support forums.

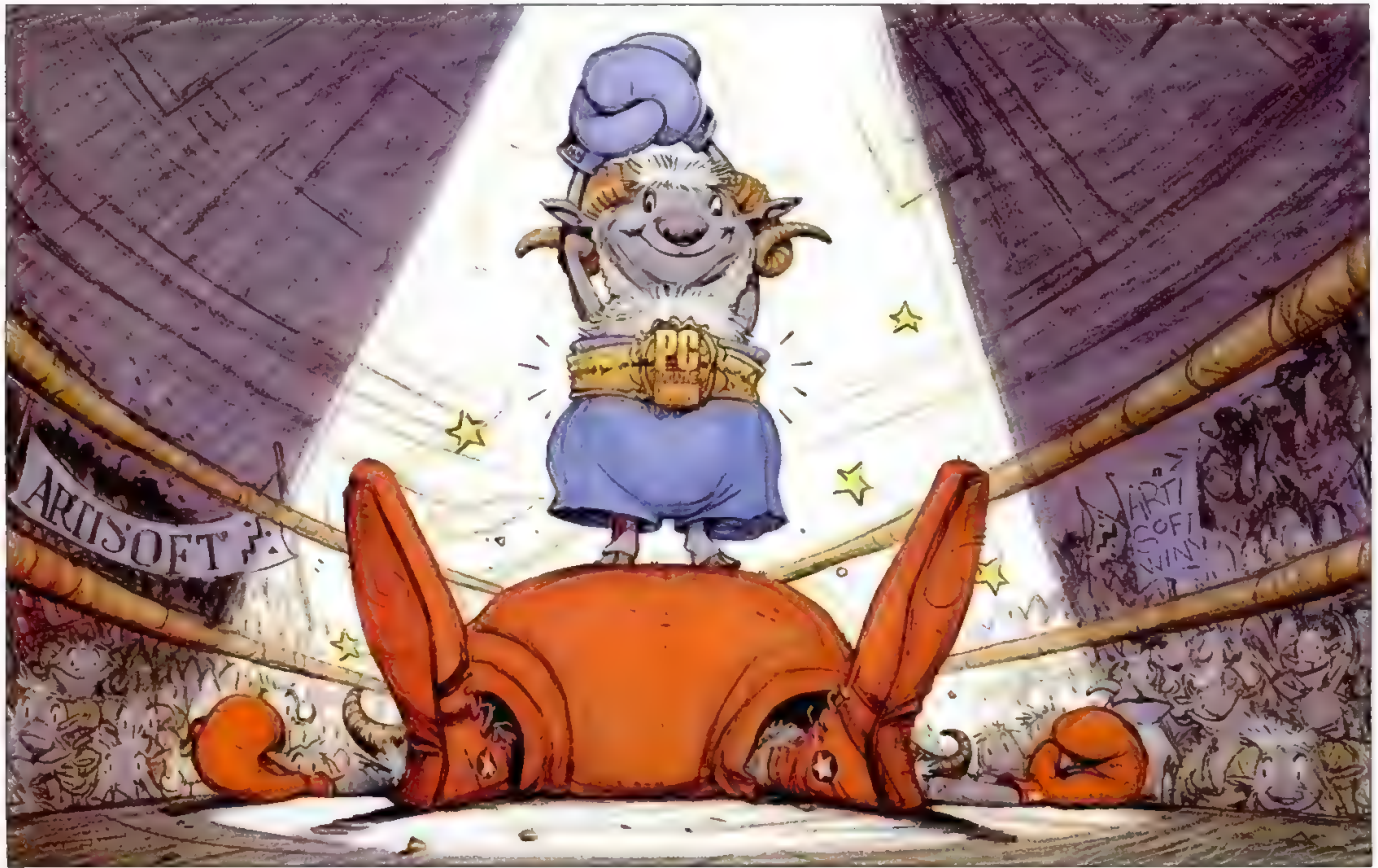
If you want the most complete virus protection, there are really only two things you can do. Call 1-800-445-4076 for more information. Or unplug your computer.

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Oct. 1991

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- Full support for Microsoft® Windows™
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Not only is the RAM requirement of the award-winning LANtastic Network Operating System 22K to 51K *lighter* than the other pretenders – it can easily be removed from memory for even *more* "punch."

High-performance, low-price, compatibility with Windows, expandability and low RAM overhead – all big advantages of our championship NOS.

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"On the whole, LANtastic is the clear winner of the bunch. It offers more and better features,... increasing productivity"

NETWORK COMPUTING® September, 1991

"...Lite's (throughput) doesn't have the punch of LANtastic. LANtastic's superior performance can be attributed to its caching... and its tight integration of hardware and software... NetWare Lite's rudimentary caching service is no match."

PC MAGAZINE® November 26, 1991

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EDITORS'
CHOICE
June 25, 1991
LANtastic, Version 4.0

LAN MAGAZINE
1991 PRODUCT
OF THE YEAR



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ARTISOFT

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691 East River Road, Tucson, Arizona 85704
Sales/Customer Service 1-800-TINY RAM

by
Emerson Andrew
Torgan

New & Improved

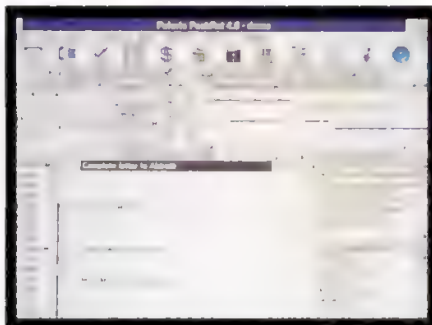
News of Announced Products and Upgrades

Network PackRat: Productivity at the Touch of a Button

IMPROVED *PackRat for Networks*, Version 4.0 of **Polaris Software's** Windows group information manager, has added Action Buttons to perform the package's most commonly used functions, including entering information, searching, attaching and deleting selected items, and launching Windows applications. A new "SmartButtons" feature allows users to define a sequence of functions and assign them to specific buttons from a palette.

PackRat 4.0 lets users add date-related information such as meetings and items from the to-do list directly to any shared calendar, and to graphically represent the duration of the entries with a color-coded stripe. Version 4.0 also lets users drag names from the phone book to a contact list, with color-coding available for high priority contacts.

List Price: *PackRat for Networks*, Version



PackRat for Networks displays color-coded tasks and calendar appointment views to groups of users over LANs.

4.0, for three users, \$695; each additional user, \$150. Upgrade from *PackRat 3.0*, \$19.95 per user; manual, \$19.95. **Requires:** 1MB RAM, Windows 3.0 or later, any network supporting Windows 3.0 or later. **Polaris Software**, 17150 Dia Del Campo, #307, San Diego, CA 92127; 800-722-5728, 619-674-6500.

CIRCLE 402 ON READER SERVICE CARD

HOT PROSPECT

MOSAIC PRINT SERVER OFFERS TOTAL CONTROL OVER NETWORKED PRINTERS

Insight Development has unveiled *Mosaic Print Server*, its \$795 network printer management software. *Mosaic* relieves the need for dedicated printers by letting networked printers accept print jobs from multiple applications and gives network administrators greater control over printing resources. It provides users with on-screen information about individual print jobs. *Mosaic* also offers font and form management, printer and print-job management, and an optional resource accounting module for administrators to track the usage of networked printers.

Administrators can assign user privileges, store and retrieve user profiles and printer definitions, and restrict access to certain printers. A hypermenu lets users navigate system menus by allowing them to jump directly to various commands.

List Price: *Mosaic Print Server*, Version 1.0, for 10 printers, \$795; for 20 printers, \$1,195; *Mosaic Accounting Option*, \$995; *Mosaic Print Server Bundle* (includes *Mosaic Accounting Option*) for 10 printers, \$1,595; for 20 printers, \$1,995. **Requires:** Dedicated PC with 640K RAM; 20MB hard disk space; either *Advanced NetWare 2.1* or later, *ELS NetWare Level II 2.1* or later, *NetWare SFT 2.1* or later, or *NetWare 386 3.0* or later. **Insight Development Corp.**, 2200 Powell St., #500, Emeryville, CA 94608; 800-825-4115, 510-652-4115.



Mosaic speeds download times by storing fonts centrally and tracking which fonts are already at the printer.

CIRCLE 401 ON READER SERVICE CARD

One-Stop CD-ROM Bundle from Corel

IMPROVED **Corel Systems** is now offering its *CorelDRAW* graphics software as part of a CD-ROM bundle. The *CorelDRAW* Blockbuster CD-ROM Bundle package includes the *CorelDriver* SCSI CD-ROM interface kit, an MPC-compatible Toshiba CD-ROM drive, and the new version of *CorelDRAW* on CD-ROM with over 10,000 clip-art images and symbols from *ArtRight*, *Image Club*, *MicroMaps*, *One Mile Up*, *Tech-Pool*, and *Totem*.

The CD-based version of *CorelDRAW 2.01* includes Dutch, English, French, German, and Spanish versions of the software and adds 52 new fonts in the .WFN and .PFB formats for a package total of 205. Corel's SCSI interface kit includes a SCSI controller, cable, *CorelDriver* software and utilities, and a new audio play utility (CD-Audio) for music CDs. **List Price:** *CorelDRAW* Blockbuster CD-ROM Bundle, with internal CD-ROM drive, \$1,295; with external CD-ROM drive, \$1,395. Upgrade from *CorelDRAW*, Version 2.0, \$595. **Requires:** Windows 3.0. **Corel Systems Corp.**, The Corel Building, 1600 Carling Ave., Ottawa, Ontario, Canada K1Z 8R7; 800-836-6366, 716-423-8200.

CIRCLE 403 ON READER SERVICE CARD

PC DOCS Speeds Document Searching on LANs

IMPROVED **PC DOCS** has released a new version of its document management software. According to the manufacturer, *PC DOCS*, Version 4.1, speeds document searching by directly accessing the server rather than the workstation. It also minimizes the amount of network traffic produced by a search.

Additional enhancements include an archive notification feature that signals administrators when users request archived documents, and multidocument editing within *WordPerfect*. New security features allow documents to be hidden and add support for *NetWare 286* users. A new document assembly engine, *DocuDraft*, supports file formats such as *dBASE* and *Paradox*.

List Price: *PC DOCS*, Version 4.0, with full-text indexing, \$295 per workstation; without full-text indexing, \$225 per workstation.

CONTINUES ON PAGE 60

New & Improved

BRIEFS



MASS STORAGE

Storage Dimensions is offering a new line of storage subsystems for Novell networks. The LANstor EL series is available in both internal and external configurations in formatted capacities of 213MB (\$1,825 internal, \$2,215 external), 339MB (\$2,755 internal, \$3,100 external), and 535MB (\$3,550 internal, \$3,850 external). 408-954-0710.

Sysgen is shipping three new portable hard drives that attach to notebooks and desktop PCs running DOS 3.0 or later via a standard parallel port. The Mobile Disk is available in 40MB (\$550), 80MB (\$795), and 120MB (\$895) configurations. 800-821-2151, 408-263-4411.

Alliance Peripheral Systems' new portable SCSI drive offers 535MB of hard disk storage in both internal (\$1,599) and external (\$1,749) configurations. The external version is available in a 6- by 8- by 2-inch (HWD) case. 800-233-7550.

Storage Solutions is now offering the SSI-1000M 1GB 3.5-inch external hard drive subsystem (\$4,295). The unit is compatible with all SCSI interfaces. 203-969-6047.

Maynard is now shipping *QICstream*, Version 2.0XL, data compression software (\$49) for the ArchiveXL tape backup system, doubling the storage capacity of the units. 800-821-8782, 407-263-3500



NOTEBOOK PCS

Acma is offering a 6.4-pound 386SX/20 that ships standard with 1MB RAM (expandable to 5MB), a 3.5-inch 1.44MB floppy disk drive, and a 40MB hard disk (\$1,795). 800-456-1818, 510-623-1212.

Centrix has unveiled its first notebook PC, a 386SX/20 with a built-in 9,600-/2,400-bps fax/modem (\$2,395). The new unit weighs 7.1 pounds and is shipping in standard configuration with 2MB RAM (expandable to 5MB), a 3.5-inch 1.44MB floppy disk drive, and a 2.5-inch 80MB hard disk. 800-888-9988, 818-855-2800.

CONTINUED FROM PAGE 59

Requires: 5MB RAM on server, 640K RAM, 1MB of extended or expanded memory, DOS 3.3 or later and *NetWare 286 2.15c* or later or *NetWare 386 3.11* on workstation. PC DOCS Inc., a subsidiary of CMS Data Corp., 124 Marriot Dr., #203, Tallahassee, FL 32301; 800-933-3267, 904-942-3627.

CIRCLE 404 ON READER SERVICE CARD

\$139 Image Edition for Windows

NEW Media Cybernetics has unveiled a \$139 imaging utility for Windows. *Halo Desktop Imager*, Version 1.0, integrates scanned and captured images from Windows applications into documents and presentations. Images can be rotated, cropped, resized, or altered through filters and special effects features.

Halo Desktop Imager reads and saves images in .BMP, .GIF, .IMG, .PCX, .TGA, .TIFF, and Halo's own .CUT file formats. The package also supports a variety of scanners. Images can be imported from and exported to Windows applications such as *CorelDRAW* and *Ventura Publisher*. Furthermore, it can output 24-bit color TIFF files and export 2,400-dot-per-inch halftone images.

List Price: *Halo Desktop Imager*, Version 1.0, \$139. **Requires:** 2MB RAM, Windows 3.0, EGA display or better, supported scanner. Media Cybernetics Inc., 8484 Georgia Ave., Silver Spring, MD 20910; 800-992-4256, 301-495-3305.

CIRCLE 405 ON READER SERVICE CARD

Compaq Ships Its Most Powerful PC

NEW Compaq has unveiled its most powerful PC to date, the Compaq Deskpro 486/50L. The EISA-based desktop unit uses an Intel 486 chip running at 50 MHz and combines new memory, cache, I/O, and disk technologies to achieve a 50 percent performance gain over 486-based PCs running at 33 MHz, according to the company.

In addition to the 486's internal 8K cache, Compaq has integrated a 256K second-level write-back cache that the manufacturer claims will provide up to a 99 percent cache hit-rate. The unit is available in three models, configured with 120MB, 340MB, and 510MB hard disks, respectively. All models include 8MB RAM (expandable to 104MB), Compaq's own advanced VGA (640 by 480 pixels with 256 colors), and seven EISA slots.

List Price: Compaq Deskpro 486/50L with 120MB hard disk, \$11,299; with 340MB hard disk, \$12,999; with 510MB hard disk, \$13,999. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269-2000; 800-231-0900.

CIRCLE 406 ON READER SERVICE CARD

New ScanMan Offers Auto-stitching, OCR Capabilities

IMPROVED Logitech has added optical character recognition (OCR) and a new auto-stitching software kernel for scanning larger images to its popular hand-held gray-scale scanner, the ScanMan Model 256/GS. The bundle includes Version 1.1 of *Perceive Personal*, OCRON's omnifont OCR software that runs under Windows. Logitech's auto-stitching feature enables users to scan images too large to be scanned in a single pass, and then reassemble the multiple scans into one image on-screen.

The 8-bit ScanMan 256/GS scanner captures images in resolutions ranging from 100 to 400 dots per inch and includes Logitech's *FotoTouch* image-editing software.



Logitech's new auto-stitching software allows users to merge up to four scans into a single image on-screen.

List Price: ScanMan Model 256/GS with OCR bundle, \$549. **Requires:** 1.5MB hard disk space, Microsoft Windows 3.0, mouse or other pointing device. Logitech Inc., 6505 Kaiser Dr., Fremont, CA 94555; 800-231-7717, 510-795-8500.

CIRCLE 407 ON READER SERVICE CARD

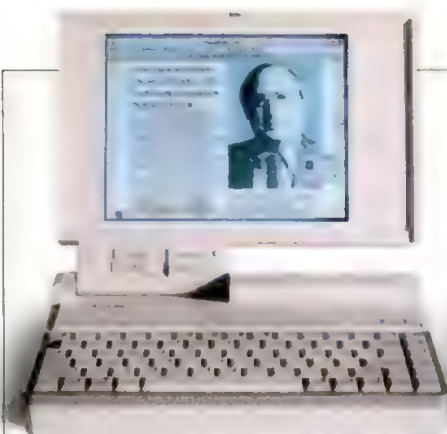
ACECAD Graphics Tablet Fits in the Palm of Your Hand

NEW Continuing the trend of miniaturization, ACECAD has significantly reduced both the size and the cost of its latest digitizing tablet. The Acecat compact graphics tablet weighs 1.2 pounds and measures 8 by 9.5 inches. The tablet supports resolutions up to 1,000 lines per inch in its 5- by 5-inch active digitizing area, and the manufacturer claims accuracy within 0.01 inch.

The package has four drivers: an AADI driver for Autodesk applications, an ACE96 driver for applications supporting a 9- by 6-inch tablet, Microsoft Mouse emulation, and a Windows 3.0 driver, so you can use the Win-

CONTINUES ON PAGE 64

Presenting
Enough
Innovations
To Fill Three
Notebooks.



NB-SL/20



NB-SL/25



NB-SL/25C

Meet the biggest breakthrough in notebooks since the spiral.

The Epson® NB-SL™ series. A new line of 386™ notebook computers with a long list of notable innovations: active matrix color, upgradable displays, removable hard drives, extended battery life, desktop expandability, and more.

Which is enough to make the NB-SL the smartest, safest, most secure choice in notebook computing. Or, in other words, the notebook that runs rings around all the rest.

The Most Brilliant Display Of Colors.

Feast your eyes first on the NB-SL/25C™, the world's first battery powered notebook with MIM Active Matrix color.* This exclusive Epson technology controls every screen pixel individually, producing color that rivals the quality and clarity of a desktop VGA monitor. It's not only a brilliant improvement over the passive matrix displays found in most portables,

but one that finally makes the notebook a presentation-quality tool.

Even if you're not ready for color, the

NB-SL series outshines the rest. Courtesy of another Epson notebook breakthrough found nowhere else: upgradable display technology. Choose either of our two monochrome models, the NB-SL/20™ or NB-SL/25™, and you'll enjoy sharp, high-contrast, 64 grey scale images for years to come, and be able to easily move up to an active matrix color display when the need arises.

No other notebook line offers such a bright future.

Drive In, Drive Out.



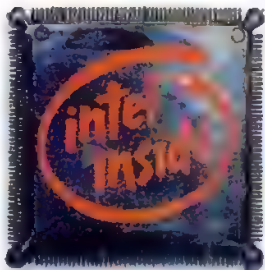
Only Epson has the drive to make notebook computing more flexible than ever. These removable, pocket-size 40MB, 60MB and 80MB hard drives are easy to transport, share, or lock away for extra security. Add an optional adapter, and the same drive will fit both your notebook and desktop.

The possibilities are endless. Using their own removable drives, several employees can share a notebook without sharing data. You can even create a whole library of drives, each with its own type of data, application or operating system.

Clearly, the removable hard drive is where notebook technology is going. And Epson is leading the way.

Turn Your Notebook Into a Desktop.
And Vice Versa.

When slipped into its optional Desktop Expansion Unit, the NB-SL looks, feels and acts just like a desktop. This combination provides all the power, performance and expandability you'll need to be highly productive now and well into the future, with a full selection of I/O ports, two standard drive bays, and two full-size AT slots.



Powered by Intel's 25MHz or 20MHz 386SL processor with 64K cache memory, the NB-SL runs longer, faster and more efficiently.

The Desktop Expansion Unit. Why your next desktop PC should be an Epson notebook.

In short, everything except compromises.

More Power To You.

Another powerful NB-SL advantage: it's virtually tireless. Using a processor specially designed for

portables, plus Epson's innovative power management software, the NB-SL can rest when you rest, automatically shut down components that aren't in use, and even "sleep" up to a week, waking automatically to take incoming faxes and E-mail. Best of

all, with normal use it will run up to six hours on a single charge.**

Wherever You Go, There We Are.

Even the service and support behind these notebooks is noteworthy. Our unique Extra Care Road Service™, free while your NB-SL is under warranty, puts expert technical assistance just an 800 number away. Anything we can't fix by phone, we'll fix by mail, by sending a replacement the next day. Pop in your removable hard drive and you're ready to go again, without

losing any precious data—or much precious time. It's an extra measure of security that only Epson can provide.

To experience the NB-SL's innovations in living color, visit your nearest Epson dealer, or call 800-289-3776 for our free brochure. And see how we've rewritten the book on notebooks.



It's like having a technical expert with you at every turn.

EPSON



Desktops



Dot Matrix



Notebooks



Lasers



Servers

BRIEFS



ACCOUNTING AND FINANCE

Computer Associates is shipping *ACCPAC Plus Accounting Accounts Payable*, Version 6.0 (\$795). The new version includes enhancements to the following areas: check processing, streamline processing prepayments, check reversals, and C.O.D. invoices. 800-645-3003.

Solutions has unveiled *The Accounting Library* (\$279), a new software program designed to help users choose the right accounting packages to suit their specific needs. The package contains information on over 80 accounting packages and is updated every six months. 800-732-1218, 804-794-3100.

GoodSoftware is shipping *Profit Point for Windows* (\$295), a small-business and personal finance accounting solution that offers a checkbook register, an expense account reporter, and eight other common accounting features. 800-925-5700, 214-239-6085.

Great American Software's Retail Express (\$199.95) is designed to provide accounting and point-of-sale features, manage check-out functions, print itemized receipts and invoices, track inventory, and manage inventory control. 603-889-5400.

Tree Based Financial Software is shipping Version 2.0 (\$129) of their product of the same name. The software offers check-style data entry into a tree-structured column/row format, such as a spreadsheet. 800-669-8733, 714-642-5387.

Financial Freedom Enterprises has released *Blueprint 3.0* (\$149.95), a financial fitness package that analyzes current debts, income, and expenses, and creates a plan to eradicate debt based on current resources. 800-669-8815, 208-529-2111.



WINDOWS SOFTWARE

Applegate Software has unveiled *OptiMem for Windows* (\$249), a dynamic link library for memory management in Windows 3.x. The package lets developers use

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dows control panel to customize the size of the active surface area. A two-button stylus pen, an RS-232C interface cable, and a keyboard adapter cable are included.

List Price: Acecat, \$129. ACECAD, P.O. Box 431, Monterey, CA 93942-0431; 800-676-4223.

CIRCLE 408 ON READER SERVICE CARD

Qmodem 5.0 Reduces Time On-line

IMPROVED Mustang Software's *Qmodem*, Version 5.0, offers a new cost-saving feature—the Off-Line Reader. It lets users quickly download large amounts of bulletin mail and read the contents off-line, reducing long-distance telephone charges. The Off-Line Reader also lets users upload reply packets to the originating BBS.

Qmodem's dialing directory now lets users specify and record directory entry settings for different BBSs. Version 5.0 includes three new terminal emulations—IBM 3101, DEC VT 52, and Heath Zenith 19—and a point-and-shoot installation menu supporting a wide variety of modems.

List Price: *Qmodem*, Version 5.0, \$99. **Requires:** 320K RAM, DOS 2.0 or later. Mustang Software Inc., P.O. Box 2264, Bakersfield, CA 93303; 800-999-9619, 805-395-0223, (BBS) 805-395-0650.

CIRCLE 409 ON READER SERVICE CARD

Micronics Bundles Notebook with Overhead LCD

IMPROVED Micronics Computers has begun shipping a 386SX-based notebook PC and separate monochrome overhead projection LCD panel. The Mpression Overhead Presentation System is available with a Micronics 386SX notebook running at either 16 or 20 MHz, and comes complete with a triple supertwist nematic 10-inch VGA LCD



Mpression's separate overhead projection LCD panel allows users simultaneous displays during presentations.

panel with a 4-foot cable and a carrying case.

Unlike systems that require removal of the backing of a notebook's only display for overhead presentation, the separate panel provides simultaneous display for the user and overhead projector. The LCD panel offers either 16 or 32 levels of gray and supports 80 columns by 25 rows of text.

List Price: Mpression Mono-386SX/16, \$4,995; Mpression Mono-386SX/20, \$5,395. Micronics Computers Inc., 232 E. Warren Ave., Fremont, CA 94539; 800-659-5901, 510-651-2300.

CIRCLE 410 ON READER SERVICE CARD

Pizazz Plus Adds File Conversion, Screen Capture

IMPROVED Application Techniques has developed a new graphics file format converter for Version 3.0 of its \$149 screen print and capture program, *Pizazz Plus*. The new bit-image file format converter supports a wide variety of file formats, such as .EPS, .GIF, .PCX, and TIFF.

Pizazz Plus has also added screen capture functionality, allowing users to capture screens in both the DOS and Windows environments. In Windows, users can capture the entire screen or only an active window. Furthermore, the package now supports the HP DeskJet 500C color printer.

List Price: *Pizazz Plus*, Version 3.0, \$149; upgrade from Version 2.0, \$49. **Requires:** 640K RAM, DOS 3.3 or later, Windows 3.0. Application Techniques Inc., 10 Lormar Park Dr., Pepperell, MA 01463; 800-433-5201, 508-433-8464.

CIRCLE 411 ON READER SERVICE CARD

5-Pound Notebook Ships with "J" Key KeyMouse

NEW Everex Systems is now shipping its 5.2-pound (including battery) Tempo Carrier 386SX/20 notebook PC with the new KeyMouse pointing device. The "J" key also serves as the notebook's pointing device. Users move the cursor across the screen by applying pressure to the edges of the key.

The Tempo Carrier comes standard with 2MB RAM, an internal 3.5-inch 1.44MB floppy disk drive, and either a 40MB or an 80MB hard disk. The unit measures 8.5 by 11 by 1.75 inches (HWD) and has an external VGA port, one parallel port, two serial ports, an external keyboard port, and an internal expansion slot for a data/fax modem.

List Price: Tempo Carrier 386SX/20 with 2MB RAM, 40MB hard disk, \$2,795. Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94538; 800-628-3837, 415-498-1111.

CIRCLE 412 ON READER SERVICE CARD



Metalis/SX Notebook PC

✓ 80C386SX Microprocessor 16.8 MHz ✓ 1 MB RAM Exp. to 2 Or 5 MB On Main Board ✓ 3.5" 1.44 MB Floppy ✓ 40 MB With Access Time Of 29ms ✓ LCD Screen B&W With 32-Gray Scale ✓ Keyboard Selectable Normal Scale ✓ Keyboard Selectable Normal Scale ✓ 640x480 Res. ✓ 80 Key Keyboard ✓ Password Protection, Extended Expanded Memory Shadow RAM, Power Management Options, Auto Mapping, Bold Font, Video Attribute, Vertical Compensation, And Width Compression ✓ System Also Includes: 2400 Baud Int Fax/Modem, Mouse Pen, User's Manual, MS DOS Custom Slip-Cover Carry Case, GeoWorks Ensemble, And 110V Power Cord ✓ One Year Parts And Labor Warranty

CDW Price **\$1599.50** 19835

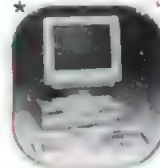
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MAGNAVOX 386SX/16

Personal Computer

✓ 386SX CPU ✓ 16.8 MHz Speed ✓ 1 MB RAM Std., Exp. to 8 MB ✓ Three 16-Bit Expansion Slots ✓ 101-Key Keyboard ✓ 1.44 MB 3.5" Floppy ✓ 1.2 MB 5.25" Floppy ✓ 40 MB Hard Drive ✓ Super VGA Adapter (800 x 600), VGA, EGA, CGA ✓ 2 Serial, 1 Parallel ✓ Novell Workstation Approved ✓ MS-DOS, MS-DOS Shell, GW-BASIC ✓ LotusWorks (Integrated Software - Word Processor, Spreadsheet, Database, Graphics, Communications, Spell Checker, Thesaurus) ✓ 1-Year Parts and Labor Warranty



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386SX/20



✓ 80386SX Processor ✓ 20/8 MHz ✓ 2 MB RAM, (8 Max.) ✓ 80 MB HD ✓ (4) 16-Bit Expansion Slots ✓ (5) 4-External, 1-Internal Drive Bays ✓ Clock/Calendar ✓ 101-Key Keyboard ✓ One 3.5" (1.44 MB) ✓ One 5.25" (1.2 MB) ✓ Super VGA (800 x 600), VGA, EGA, MCGA, CGA, MDA, Hercules ✓ Parallel Port, 2 Serial Ports, U64 Video Port ✓ 3-Button Serial Mouse ✓ Operating System: MS-DOS® 5.0, Q-Basic ✓ Microsoft Windows 3.0 ✓ Includes Word Processor, Paint Program, Communications Program, Calendar Planner, Calculator, Clock Program, Cardfile and Notepad, Macro Recorder, Two Games ✓ Novell Workstation and Server Approved. Windows 3.0 Certified ✓ 1 Year Parts/Labor (1 Year On-Site Service)

CDW Price **\$1132.50**

MAGNAVOX 386SX/20 CD Model (1 Year Warranty, 6 Months On-Site)

CDW Price **\$1577.27** 19833

Selected As PC Magazine's Editor's Choice



MAGNAVOX 386/33 Personal Computer

✓ 386DX CPU ✓ 33/8 MHz Speed ✓ 2 MB RAM Standard, Expansion to 84 MB ✓ Six 16-Bit Expansion Slots ✓ On-Board Clock/Calendar ✓ 101-Key Keyboard ✓ AT-IDE Hard Disk and Floppy Controller Built-In ✓ 1.44 MB High Density 3.5" Floppy Disk ✓ 1.2 MB 5.25" Floppy Disk ✓ 120 MB Hard Drive ✓ Analog Output Which Supports Extended VGA, Super VGA, VGA, EGA, MCGA, CGA, MDA, Hercules (1024 x 768 x 16) ✓ 512 K Video RAM ✓ 2 Serial, 1 Parallel, 1 Video Ports ✓ Novell Workstation and Server Approved. Windows 3.0 Certified. SCO Certified (for UNIX and ODT) ✓ Operating System Software: MS-DOS, MS-DOS Shell, GW-BASIC, LIM EMS 4.0 Drivers ✓ Embedded Disk Software: LotusWorks (Integrated Software - Word Processor, Spreadsheet, Database, Graphics, Communications, Spell Checker, Thesaurus) Lotus Magellan (File Management Program) ✓ 1-Year Parts and Labor Warranty ✓ 6 Month On-Site

CDW Price **\$1580.37** 19834

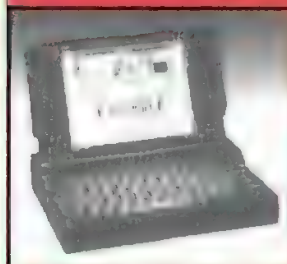
MAGNAVOX



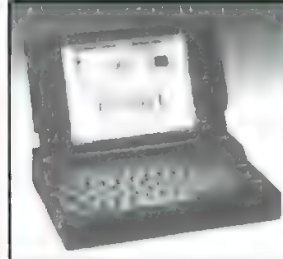
MAGNAVOX Metalis/SX20 Notebook PC

MAGNAVOX

✓ 80C386SX Microprocessor, 20/10 MHz ✓ 2 MB RAM, Expandable to 8MB ✓ Clock/Calendar ✓ LED Indicators ✓ 3.5, 1.44MB Floppy ✓ 2.5 60MB HD With Access Time of 19ms; Auto-Park Feature ✓ Full Travel 80-Key Keyboard With 12 Function Keys and Imbedded Numeric Keypad; Emulates 101/102 Key Enhanced Keyboard ✓ B&W With 32 Gray Scale, CCFT Side-Lit, VGA 640 x 480 Resolution, .27mm Dot Pitch, Brightness and Contrast Adjustable Via Keyboard ✓ Input/Output Ports ✓ Power Management Features ✓ User-Definable Options in Set-Up Utility ✓ Battery-Rechargeable ✓ One Year Parts and Labor Warranty



CDW Price... **\$1976.74** 20955



Metalis 286

✓ 80C286 Microprocessor, 12/6 MHz ✓ 1 MB, Expandable to 2, 5, or 8 MB ✓ Clock/Calendar ✓ LED Indicators ✓ 3.5", 1.44 MB ✓ 2.5" 20 MB With Access Time of 23ms; Auto-Park Feature ✓ B&W With 32-Gray Scale, CCFT Side-Lit ✓ VGA 640 x 480 Resolution, 0.27mm Dot Pitch ✓ Input/Output Ports ✓ Full Travel (3.5mm) 79/80-Key With 12 Function Keys and Imbedded Numeric Keypad; Emulates 101/102-Key Enhanced

Keyboard ✓ Power Management Features ✓ User-Definable Options in Set-Up Utility ✓ Battery-Rechargeable ✓ One Year Parts and Labor

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New & Improved

BRIEFS

CONTINUED FROM PAGE 64

standard C and C++ memory allocation APIs and port their applications to Windows without changing memory management code. 206-868-8512.

Decisioneering is now shipping its risk-analysis software package, *Crystal Ball for Windows* (\$195), for Excel spreadsheet users. The package uses DDE to assess project risks and display forecasts graphically. 800-289-2550.

Cognos has unveiled a new Windows-based desktop SQL query tool. *Impromptu* (\$695) lets users enter complex queries without knowledge of SQL query syntax, using mouse clicks within Topics menus. 800-426-4667.

Control Data is shipping *VistaCOM for Windows* (\$250), providing terminal emulation, scripting, file transfer, and LAN connectivity. The package includes VT52, VT100, VT220, and TEK 4010, 4014, 4105, 4106, 4107, 4109, 4205, 4207, and 4209 emulations. 301-808-4270.

Persoft's *SmarTerm 420 for Windows* (\$295) provides emulation of all VT series text terminals and supports multiple host connections through LAT and Telnet implementations. 608-273-6000.

Walker Richer & Quinn is shipping *Reflection 2 for Windows* (\$299), its new VT320 terminal emulation software that supports keyboard mapping. 800-872-2829, 206-324-0350.

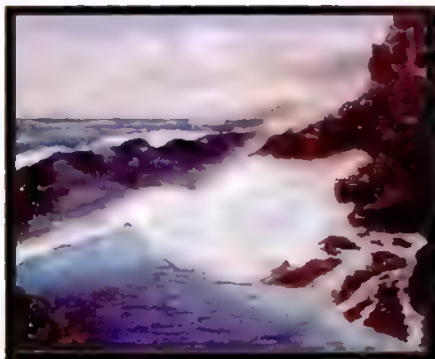
Blue Sky Software has unveiled *RoboHELP* (\$495), a help systems authoring tool for use with Windows 3.x help compilers found in *Borland C++ 2.0* and *Microsoft SDK 3.0*. The software has a visual tool palette for design and generates source code. 800-677-4946.

Intex Solutions is shipping three new add-ins for *Lotus 1-2-3 for Windows*. *Bond Calculations* and *Mortgage-Backed Calculations* are available in basic (\$495) and advanced (\$795) versions. *Option Price Calculations* is available for \$495. All offer calculations such as convexity and accrued interest. 617-499-6222.

Paint Like the Masters On-screen

IMPROVED **Fractal Design Corp.** is offering a Windows version of its natural-media paint program. *Fractal Design Painter*, Version 1.2, lets users work with simulations of the tools and textures available to artists working with natural media. The 24-bit color program supports the Wacom pressure-sensitive stylus.

The drawing palettes can be set to react to various tools as drawing paper, as watercolor paper, or as canvas. Brush, charcoal, chalk, pencil, and felt-pen tools let users sketch, paint, and design original art or alter and enhance scanned and imported images. A unique special-effects tool emulates the brush strokes of the master artists van Gogh and Seurat. *Fractal Design Painter* supports the .BMP, .PCX, .RIF, .TGA, and TIFF file formats.



Fractal Design Painter lets you choose among various tools and textures that emulate natural media.

List Price: *Fractal Design Painter*, Version 1.2, \$399. **Requires:** 386-based PC or better, 6MB RAM, color monitor (Super VGA or better recommended), Microsoft Windows 3.0, Wacom pressure-sensitive stylus, compatible math coprocessor. Fractal Design Corp., 101 Madeline Dr., #204, Aptos, CA 95003; 408-688-8800.

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Folio's MailBag Stores, Indexes Your Network Mail

NEW **Folio** is now shipping a new electronic mail add-on for use with *NetWare* networks. *MailBag* works with popular e-mail packages such as *Da Vinci eMail*, *WordPerfect Office*, and *Lotus's cc:Mail*. *MailBag* archives and compresses electronic mail and uses *NetWare's* on-line Help Utility (a read-only version of *Views*, Folio's retrieval engine for managing infobases) to search for and retrieve electronic messages, including attachments.

Users create infobases. Tagged messages

from your e-mail software are routed by *MailBag* to a queue, then *MailBag's* server program redirects them to the appropriate user's infobase. Messages are compressed and indexed for full-text retrieval through combinations of words, phrases, and numbers.

List Price: *MailBag*, Version 1.0, \$295 for 25 users. **Requires:** 512K RAM, DOS 3.0 or later, *NetWare* (supports all versions except *NetWare Lite*), compatible e-mail program. Folio Corp., 2155 N. Freedom Blvd., #150, Provo, UT 84604; 800-543-6546, 801-375-3700.

CIRCLE 414 ON READER SERVICE CARD

Mitsubishi Color Printer Accepts Video Output

NEW **Mitsubishi** has unveiled the CP-50U video printer, an 8-bit color dye diffusion thermal transfer unit, which, according to the manufacturer, can generate images with up to 16.7 million colors from a variety of video imaging sources such as PCs, VCRs, and video cameras. The CP-50U outputs 4- by 3-inch color images on Mitsubishi's own print paper. It can produce 256 color gradations per dot in its 800-dot by 480-line imaging area. The CP-50U comes standard with analog RGB, S-video, and Centronics parallel interfaces.

The unit offers a monitor print preview, and adjustment of red and blue levels. A single printed sheet can accommodate 4, 16, or 25 different images, and 2, 6, or 24 duplicates of the same image.

List Price: Mitsubishi CP-50U, \$2,995.

Requires: Mitsubishi Professional Electronics Div., 800 Cottontail Ln., Somerset, NJ 08873-6759; 800-733-8439.

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EndNote Plus Creates Bibliographies

IMPROVED **Niles & Associates** is shipping an updated version of its bibliographic software, complete with a new QuickFind feature. *EndNote Plus* stores up to 32,000 records in its database and creates bibliographies. QuickFind, its full-text index, searches the database either by author and year or by author, year, and keyword.

EndNote Plus adds the ability to read and write *WordPerfect* or *Microsoft Word for Windows* documents. Citations from the database can be pasted into either wordprocessor. *EndNote Plus* then scans the document for citations, reformats according to a user-defined journal style, and creates a reference list at the end.

List Price: *EndNote Plus*, Version 1.0, \$249.

Requires: 512K RAM, DOS 3.0 or later. Niles & Associates Inc., 2000 Hearst St., Berkeley, CA 94709; 510-649-8176.

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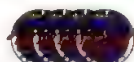
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CIRCLE 187 ON READER SERVICE CARD

edited by
Carol Levin

Read Only

Reviews of the Latest Books for the PC User

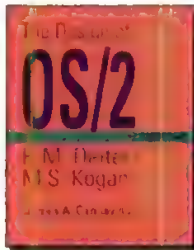
IBM Insider and Systems Expert Lead Architectural Tour of OS/2 2.0

An incredible number of books for OS/2 users and programmers were released during 1987 and 1988, but when OS/2 failed to gain any significant acceptance, the bookstores eventually caught on. Publishers and authors took a severe financial beating during 1990 as OS/2 books were returned to the warehouses.

But "hope springs eternal in the human breast," wrote Alexander Pope, and apparently it's true in the computer publishing industry as well. After taking a year to lick their wounds, a few publishers are venturing into the marketplace on the eve of the introduction of OS/2 2.0 with the hope that IBM can do alone what IBM and Microsoft couldn't do together.

The Design of OS/2, by Harvey Deitel and Michael Kogan, isn't a programming book, but an architectural book that explains how the system works and how it's put together at a fairly high level. It does not explain how to use the application program interface (API) functions in your own development efforts. Thus, it is analogous to Gordon Letwin's *Inside OS/2* (Microsoft Press), rather than Charles Petzold's *Programming the OS/2 Presentation Manager* or my own *Advanced OS/2 Programming* (both Microsoft Press).

The first of three distinct sections briefly sketches the history of the personal computer as seen by IBM insiders: a survey of the Intel 80x86 family of CPUs, a summary of the IBM personal computer line from 1981 to the present, and an overview of the differences between DOS, OS/2 1.x, and OS/2 2.x.



The real meat of the book begins in the next four chapters that cover OS/2 kernel issues: multitasking, memory management, interprocess communication, and I/O management. They offer lots of useful information at a level of detail that I have not seen anywhere else. In particular, the operation of the OS/2 1.x and 2.x kernels is carefully compared and contrasted, and the figures and diagrams—over 130 in all—are helpful.

The last four chapters on presentation management, compatibility, communications, and future directions of OS/2 are not as complete. OS/2's complex graphical user interface, the Presentation Manager, is covered in less than 20 pages, and the critical issue of Windows 3.x compatibility under OS/2 is dismissed with a single paragraph.

Each chapter closes, textbook-style, with a lengthy set of exercises, but it's hard to imagine a book this slanted as a college text, and real software developers need source code ex-

Finding Their Way into OS/2

The IBM development team working on OS/2 2.0 needed to have all the material relating to 32-bit design in one place: design documents, inventions, patents. "Things were all over the place," says Michael Kogan, chief architect of OS/2, who teamed up with Harvey Deitel, author of several books including the classic *Operating Systems* (Addison-Wesley, 1990), to put everything in one place—*The Design of OS/2*.

Their paths crossed when Kogan turned out to be an anonymous reviewer of *Operating Systems*. "He was by far the toughest reviewer I had ever faced: as tough as nails but constructive," says Deitel. Kogan wanted a signed copy of the published book, which Deitel sent him along with a note suggesting they collaborate on a book about OS/2. The objective of the two was to examine—in compact form and without getting down to the code level—what goes on inside the base operating system.

Kogan joined the Boca Raton-based development team in 1985 at age 23 to lead the design, development, and testing of the 16-bit versions of OS/2, and later, the 32-bit version that's expected to ship in March. Deitel was on a pioneering team that developed IBM's OS back in 1963 and is currently researching open systems interconnection (OSI), the emerging global standard for networking. Kogan is currently working on IBM's OS/2 multimedia applications. Together, Kogan and Deitel are collaborating on a new book about IBM's multimedia architecture.

—Carol Levin

amples; they get more than enough exercises already in the course of their daily work. Despite these problems, there is, for now, no alternative source for the information found in *The Design of OS/2*.—Ray Duncan

The Design of OS/2

by Harvey M. Deitel and Michael S. Kogan, \$40.95, Addison-Wesley Publishing Co., Reading, MA 01867; 617-944-3700.

ISBN: 0-201-54889-5.

CIRCLE 492 ON READER SERVICE CARD

Laptop Guides Help You Slim Down and Power Up for On-the-Road Computing

As good as today's laptops and notebooks are, they still present unique challenges. Two new books offer the accumulated wisdom of three authors who've logged many a mile with a laptop case slung over their shoulders. Steve Cummings' *The Little Laptop Book* provides not only a comprehensive overview of laptop computing issues but also a trove of spe-



cific advice. Beginners will find this 181-page guide indispensable, and seasoned road warriors will be surprised to discover a variety of tips and tricks that will simplify their on-the-go working existences.

Right from the start, Cummings lucidly and methodically guides the reader to the purchase of a suitable laptop. He

first helps the consumer assess individual needs and follows it up with plenty of practical advice about screens, keyboards, and other critical features of any laptop. A laptop buyer's checklist condenses much of this advice into a single page of issues to remember when shopping.

Cummings makes his recommendations on choosing software with an eye to the limited storage and processor resources of most laptops, and he often emphasizes quality shareware solutions. That's a great help to budget-conscious users who are, in many cases,

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configuring a secondary system.

Your entire investment in *The Little Laptop Book* could well be repaid by its advice on telecommunications alone. Cummings details several indispensable techniques—obviously learned from long experience—for connecting your modem to phone lines in hotel rooms and other hostile environments.

The overall organization is superb, with tips and suggestions highlighted in the margins throughout the book. Products that solve particular problems are frequently and clearly mentioned, including manufacturers' addresses and phone numbers.

Only some annoying proof-reading lapses mar *The Little Laptop Book* ("Clock speed is expressed in millihertz;" it should be megahertz). This is a beautifully researched, well-written companion for anyone who dares to venture beyond the desktop.



The Laptop User's Survival Guide, by Jeffrey H. Lubeck and Bruce D. Schatzman, brings together some

very useful tips and suggestions for effective computing on the road. Some of the authors' recommendations tread the line between fact and opinion, however, and some of their advice is more relevant to PCs in general.

The authors make excellent points about basic precautions that most users fail to take. Carrying backups of critical files on the road is a good example. But they occasionally take too much space to make a simple point. They spend two pages explaining that longer power and phone connection cords are a good idea.

On the other hand, the authors lay out a simple, useful procedure for swapping multiple

AUTOEXEC.BAT and CONFIG.SYS files in about the same amount of space. Another immediately useful tip identifies DOS and Windows files that can be deleted to save scarce hard disk space and lists the savings provided by each deletion. An appendix provides suggestions for slimming down seven other common applications for travel.

In discussing file exchange on the road, the authors argue that users should adopt the most widely used applications, since other users will be more likely to directly use the files generated by programs like *WordPerfect* and *Lotus 1-2-3*. This certainly makes sense, but is it enough of a justification for choosing one software package over another?

There are too many good tips to list, but the chapter on faxing on the road must be mentioned along with an excellent discussion of finding adequate power connections in hotel rooms. A more thorough discussion of strategies for connecting modems to

hotel phones would be useful.

The Laptop User's Survival Guide is not an attempt to comprehensively cover every issue related to laptop computing, and the 50-page command summary for commonly used software is of questionable relevance. But the book offers so much useful advice that it is worth a look for moderately experienced users who seek ways to make their laptops the most efficient tools possible.—Jonathan Matzkin

The Little Laptop Book

by Steve Cummings, \$14.95, Peachpit Press, 2414 Sixth St., Berkeley, CA 94710; 800-283-9444, 510-548-4393. ISBN: 0-938151-53-3. CIRCLE 493 ON READER SERVICE CARD

The Laptop User's Survival Guide

by Jeffrey H. Lubeck and Bruce D. Schatzman, \$24.95, Sybex Inc., 2021 Challenger Dr., Alameda, CA 94501; 800-227-2346, 510-523-8233. ISBN: 0-89588-863-7. CIRCLE 494 ON READER SERVICE CARD

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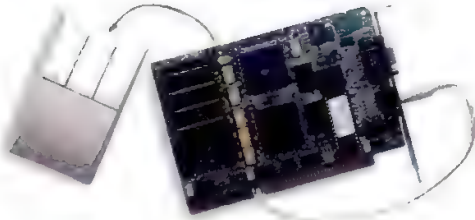
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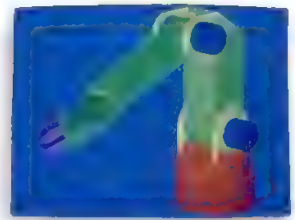
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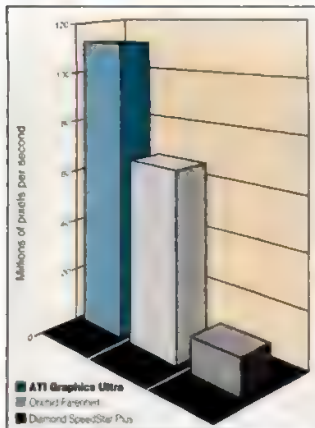
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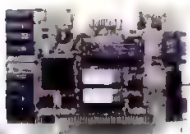
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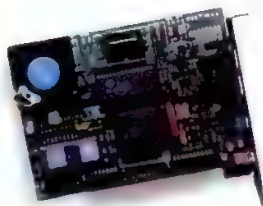
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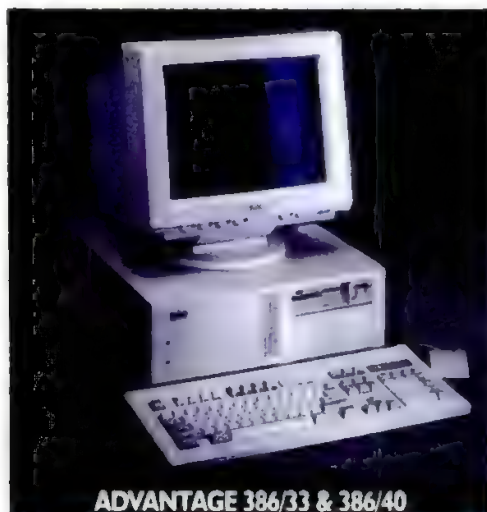
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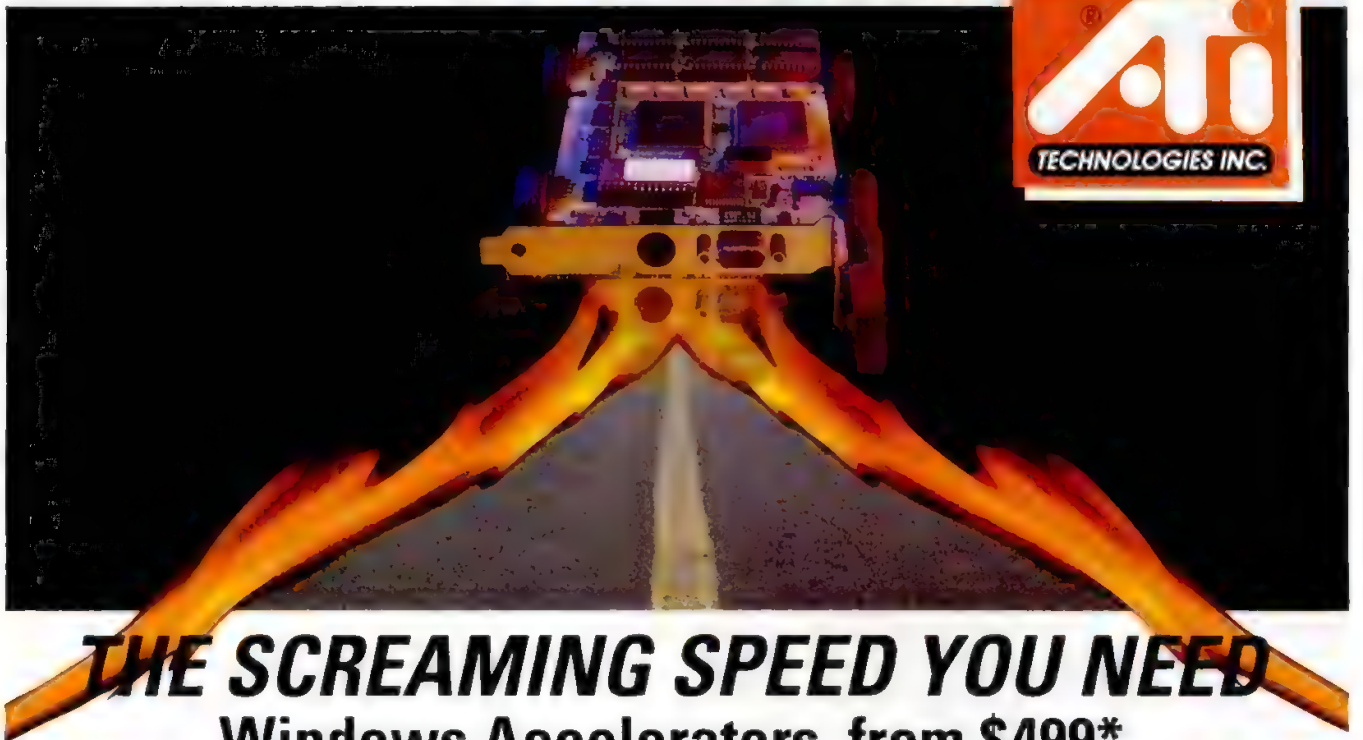
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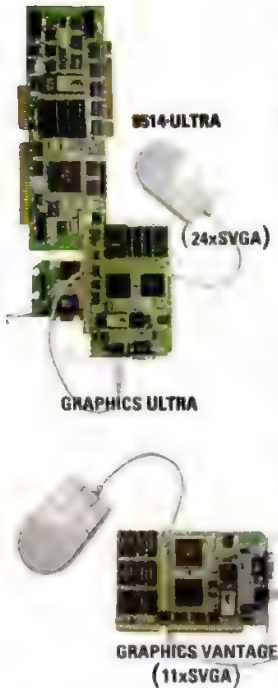
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edited by
Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

Back To—Or Beyond—The Basics: Which SQL-Based Database DLL Is for You?

Ocelot2-The SQL! and Quadbase-SQL/Win are two SQL-based relational database engines with many features in common, including support for DOS and Windows. However, while Ocelot Computer Systems took a bare-bones approach, Quadbase Systems goes beyond the basics.

At \$195, Ocelot2 includes OCELOT.EXE and WIN_SQL.EXE (interactive SQL front ends for DOS and Windows, respectively), a Report Writer, and single-user versions of the Ocelot2-SQL engine for DOS and Windows. A 16-user version is available for \$450, and for a one-time-only fee of \$500 you can purchase unlimited distribution rights to the DOS or Windows database engine and source code for the Report Writer.

Ocelot2-The SQL! (pronounced "The Sequel!") works with a number of DOS development languages including QuickBASIC, and Microsoft, Borland, and Zortech C/C++ compilers. Since the Windows version is a DLL (dynamic link library), Ocelot2 can be used with any

of these that support Windows development. Unfortunately, this DLL can't support multiple, simultaneous instances of Ocelot2-based applications. And while you can use the static LIB version that's included, this defeats the whole purpose of offering a database engine in DLL form: having multiple applications share the same code.

Ocelot2 offers three forms of data security. The first two, the SQL GRANT and REVOKE com-

mands and optional password security, are standard. But the third, data encryption, is unusual. Ocelot2 encrypts files as they are written to disk. Unfortunately, this imposes a performance penalty. A more serious disadvantage, though, is that you have to use Ocelot2 to read the data. While this may not be a problem on a day-to-day basis, you'll be out of luck if you have to recover a corrupted Ocelot2 file with, say, *The Norton Utilities*. Ocelot2 includes a utility for creating unencrypted backups. Yet, making unencrypted backups of encrypted files defeats taking this security measure in the first place.

Ocelot2's C interface conforms to the standard you'd expect with Embedded SQL: All C variables shared by C and SQL must be declared in a marked section of the program source code. While the DOS version lets you use virtually any memory model (except Tiny), Windows applications must be compiled with Large model only: All engine routines are FAR calls with FAR parameters. However, the engine uses temporary memory allocations to optimize WHERE, ORDER BY, GROUP BY, and DISTINCT clauses, as well as CREATE INDEX commands.

QUADBASE-SQL/WIN

Quadbase's API can be called from a number of different environments, including C, C++, Visual Basic (VB), Smalltalk/V, ObjectView, SQLWindows, and Actor. However, neither Quadbase nor Ocelot2 provides C++ objects: They have C functions that are callable from C++.

The DOS version of Quadbase-SQL/Win includes a number of tools for application development, such as a screen and



windowing interface library and a set of functions dubbed *The Application ToolBox*. In addition, it contains

user-defined functions (UDFs), callable from *Clipper*, and even offers *dBASE*-like functions and commands for use in *dQuery*.

dQuery (First Looks, May 16, 1989) and the new *VBQuery* (written in Visual Basic) are Quadbase's visual, interactive SQL interfaces. They let you store SQL statements in text files, which in turn you can run or use to operate on both *dBASE III* and *Lotus 1-2-3 .WKx* files. Each sports a full-featured text editor and report generator. For example, you can use *dQuery* to create report forms and to design SQL statements to be used in your Quadbase applications. You can also use *dQuery* and *VBQuery* to import existing *dBASE* files into a database schema; Quadbase uses the *dBASE III+* file format and can read *FoxPro*, *Clipper*, and *dBASE IV* files.

While *dQuery* offers a nice QBE (query by example) facility, *VBQuery* uses forms and dialogs to let you create a database schema, generate tables, and enter data. You can also register new users and change passwords. The Create Table dialog lets you type in column names, click on radio buttons to select the column's data type, and use check boxes to select the column attributes (for example, Not Null, Unique, and so on). But both *dQuery* and *VBQuery* are handy for table browsing and editing.

You can call the engine via embedded SQL or via direct calls to the engine's API; the package comes with example applications

to show users just how it's done.

DOS and Windows versions of Quadbase are \$795 and \$595, respectively. Multiuser runtime versions start at \$500 for a five-user network, and run to \$1,200 for a single network with an unlimited number of users. Unfortunately, there is no unlimited runtime arrangement, and the product will prevent you from running the single-user version on a single workstation.

Ocelot2's database engine took more than twice as long as Quadbase to load a data file, due to the former's data encryption schemes. But Ocelot2 was able to search and update a table much faster: In a 5,000-record table, the search test took less than 3 seconds (to Quadbase's 7.62) and a global update took barely 8 seconds (to Quadbase's 11).

If you're looking for a low-cost SQL engine without a lot of frills but with a straightforward runtime policy, you're going to like Ocelot2. On the other hand, if you'd like a SQL engine with many well-developed, interactive tools and you don't have to be too cost-conscious, you'll find Quadbase a winner.

—Richard Hale Shaw

Ocelot2-The SQL!, Version 2.12

List Price: \$195. **Requires:** 286-based PC or better, 4MB RAM, DOS 3.1 or later. Ocelot Computer Systems Inc., #1104, Royal Trust Tower, Edmonton Centre, Edmonton, Alberta, Canada T5J 2Z2; 403-421-4187.

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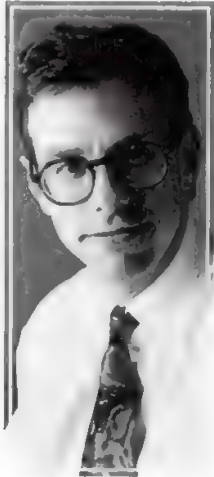
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*See data sheet for details, model 250.
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Michael J. Miller



The Incredible Shrinking Motherboard

Until now, component integration meant greater similarities among PC products. But greater features integration may become the way we differentiate one PC from another.

Many people are now talking about the PC market as a "commodity business." I for one think they're dead wrong.

In a commodity business, all products are considered the same. While they may all be endowed by their creators with certain standard features, all PCs are not created alike. We have 286s, 386SXs, 386/25s and 33s, 486SXs, 486DX/25s, 33s, and 50s, and more on the way. Are they all the same? Of course not.

Even among machines based on the same CPU, we see different levels of performance due to variations in hard disks, video subsystems, memory caches, etc. Then there are

physical differences. We have desktops (small-footprint machines, "pizza boxes," towers, and mini-towers), portables (luggables, laptops, and notebooks), and servers (even super-servers). Again, are they all alike? Not a chance.

But is there a basic level of similar-

ity? Certainly. All of these machines feature Intel architecture and are compatible with DOS. Still, just because most cars run on unleaded gasoline, that doesn't mean that all cars are commodities. There are as many differences among these computers as there are among a two-door economy hatchback, a luxury touring sedan, and a 4x4 pickup. I've driven all of these cars on one business trip or another (many thanks to Hertz and Avis), and let me tell you, they aren't commodities either.

People think that PCs are commodities now because lower prices have become such an important part of the PC buying equation. There are enough good third-party components available now that almost any PC you buy will run adequately. Word on the street has these products becoming more and more alike, and eventually only price will be a difference.

I simply don't believe it.

Ever since the original IBM PC debuted in 1981, we've seen more and more integration. IBM's PC had literally hundreds of discrete components. Chips and Technologies made a

major breakthrough in 1985 by replicating all of the components on the IBM PC motherboard in just five ASICs. Around the same time, Award, AML, and Phoenix Technologies perfected their BIOSes. With the sudden availability of third-party BIOSes and an inexpensive chip set, the PC market exploded.

A few vendors still make their own chip sets, and even fewer write their own BIOSes; Compaq, IBM, and Tandon come to mind. Currently, PC vendors differentiate their systems by varying hardware components—the memory, disk, and video subsystems.

INTEGRATE AND CONQUER

But consider what's been happening in CPU design. Roughly every three years, we see a new generation of CPU's containing roughly four times the number of transistors as the generation before. We've moved from the 386 (a 300,000-transistor chip) to the 1.2 million-transistor 80486. With the 486, Intel combined a 386 CPU, a 387 math coprocessor, a cache controller, and 8K of internal cache. And with its 386SL, Intel has integrated virtually everything in a computer—including graphics, disk controllers, and serial and parallel ports—into that and one other chip.

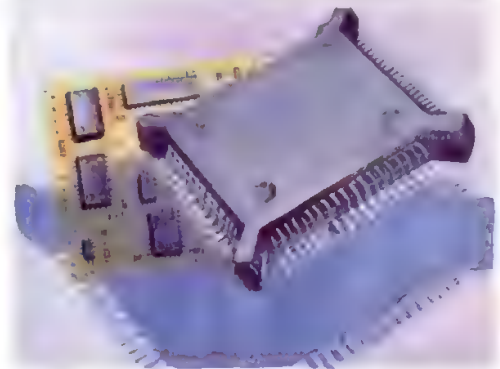


ILLUSTRATION: JACQUI MORGAN

Now, we're about to see the 4 million-transistor generation of CPU. It will certainly have enough room for all that the 486 offers, plus graphics, an external cache controller, all the other internal controllers, and lots more. And that would probably force machines to be more alike.

You could also conclude that PCs are growing more alike from the fact that the 486 is essentially just a fast 386 in terms of how

Michael J. Miller

applications relate to it, and because 386 functionality is now available not just from Intel but also from AMD and C&T.

Well, that's about to change. With the ability to produce higher-transistor chips, you can now imagine a machine vendor contracting one of these companies to

create a custom chip with 386 functionality plus specified additions. IBM's recent 386SLC, which integrates an on-chip cache with the 386SL, is such an example. It works so well that IBM and Intel have agreed to renew the joint venture between the two firms to create semicustom chips in that fashion.

Expect to see this in video, too. Certainly, larger PC vendors will contract "semicustom" chips combining standard

CPU functions with some unique video feature. Perhaps that explains Compaq's interest in Silicon Graphics?

For this to work, major vendors will need multiple custom chip sources creating chips that will be both compatible and extensible. The extensibility isn't a problem, because modern chip design is based on "standard cells," the functional equivalent to the reusable objects used in object-oriented programming.

In the future, you can imagine a 386-compatible standard cell available from AMD, C&T, Intel, etc. But if Intel controls the basic CPU (and remember, there's some interesting litigation still pending), this strategy would require a second source for compatible chips—a source amenable to licensing its standard cells to chip houses.

If, however, Windows becomes the operating system standard among software developers, and if Windows can be run on other hardware (Microsoft says its NT version will), then that second source doesn't have to be 386-compatible after all. Could this be why Compaq and other Intel-dependent PC manufacturers have packed the ACE consortium, with its option of using the MIPS chip?

You could argue that most vendors wouldn't care about creating their own custom chips, and you'd be right. But the first-tier players like IBM, Compaq, and Hewlett-Packard need something they can use to differentiate their machines and get higher profit margins.

I would expect one of the first semicustom projects to be a joint IBM/Intel effort, a 486 with integrated Micro Channel that's faster and cheaper to produce than existing designs. Of course, other vendors could as easily integrate EISA. In the long term, I expect to see things like video compression, sound, CD-ROM controllers, and maybe networking components all integrated into these chips.

There's always a downside. These highly integrated chips at first will be more expensive to produce, and they may limit upgrade possibilities. Still, such integrated chips should prove faster and more reliable than chip sets. My guess is you'll see such massive chips from a dozen or so vendors within the next five years.

Until now, greater integration made PCs more alike. But more on-chip integration may facilitate greater functional differences among compatible machines—and a radically different PC industry in the none-too-distant future. ■

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A photograph of a FastData 486/33 computer system. On the left is a white vertical tower unit with a 3.5-inch floppy disk drive at the top, a 5.25-inch floppy disk drive below it, and a control panel at the bottom featuring a digital display showing '33', a power button, and several indicator lights. A vertical cooling fan grille is located below the control panel. To the right of the tower is a CRT monitor displaying the text '486 33 Mhz' in large yellow characters on a purple background. In front of the monitor is a white keyboard with a numeric keypad. The entire setup is on a yellow surface.

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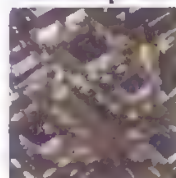
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CIRCLE 329 ON READER SERVICE CARD

Bill Machrone



Mortgaging The Future

Research and development spending has all but disappeared from computer manufacturers. Who's picking up the slack?

Compaq is a good if late example of the new order: lean, mean companies trying to build machines that are cost-competitive, if not cutting-edge. Performance-oriented research and development is underappreciated these days. So why spend 7 percent on R & D if you can get by with 4? Or why spend anything if you can get somebody else to do it for you?

Compaq has been the R & D department for many clone manufacturers over the years; it's the price of technological leadership.

You do something innovative. If it succeeds, you're imitated. I've heard people say that other cloners are merely doing to Compaq what Compaq did to IBM. They're wrong, and here's the reason why.

When Compaq *cloned* the PC (that's a hated word down in Houston), it was all done by the book. The company built a clean-

room BIOS, meaning that Compaq started with what the BIOS was supposed to do, without access to the actual source code. The resulting BIOS was functionally compatible but didn't infringe on IBM's copyrights. Reverse-engineering this process was tremendously expensive and time-consuming. In a time when perhaps half a dozen people in the country knew how to write a BIOS, Compaq built the capability in-house.

Compaq also went beyond IBM in several key areas, such as combining monochrome and color compatibility in one video subunit. That may seem like a yawner today, but it was a pretty big deal nine years ago. The bullet-proof nature of the original Compaq and Compaq Plus laid the groundwork upon which the fabulous Deskpro machines were built. The Deskpros proved that you could build machines faster than IBM's and still have them be fully compatible. When the cloners looked around for something to copy back in the mid-eighties, they targeted Compaq, not IBM. This process culminated in the Deskpro 386, which logically extended AT architecture to handle Intel's new 386 processor, beating IBM to market by more than six months.

Other companies were also socking large amounts of R & D into their products, but with mixed results. AT&T, Canon, NEC, Tandy,

Texas Instruments, Zenith, and a little company called PC's Limited all took liberties with the standard in one way or another, producing machines with limitations and incompatibilities. At the same time, we saw the rise of BIOS vendors such as AMI and Phoenix. They strove to flatten the differences in hardware designs and make them invisible to the software. The BIOS vendors shifted some of the R & D away from the computer builders, and frankly, this resulted in better, more compatible products.

The next big change in the market was the emergence of the motherboard design houses. AMI, Micronics, The Motherboard Factory, and numerous others used their own (or other) BIOSes and hardware designs to build generic motherboards with a selection of on-board features. At this point, the enterprising clone builder barely had anything left to do other than buy the pieces and bolt them together. Companies with engineering know-how could still add value and performance well beyond the lowest-common-denominator motherboards, but the incremental cost was and is onerous. You have to build a heck of a lot of machines to amortize the additional cost of the engineering staff.



ILLUSTRATION: JACQUELYN MORGAN

THE END OF NIH

Enter the specialized chip vendors. Chips and Technologies was busily reducing the motherboard's chip count by building VLSI (very large-scale integration) chips that combined many functions onto a few chips. Each IC the company eliminated was another design step rendered unnecessary, a shorter time to market, and a little less engineering. This trend has continued to the point of one-chip mother-

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Bill Machrone

boards (excluding memory).

Other companies have followed in Chips and Technologies' pioneering footsteps, investing large amounts of venture capital into the research necessary to move the many motherboard functions to two or three chips. The result: less R & D by personal computer manufacturers. Some big manufacturers still design and build their own VLSI circuits, but it's just not economically viable any longer. It's a safe bet that Compaq's new, company-saving, low-cost machines will have commercial chip sets in them, not custom designs.

There was a time when companies like Compaq could outmaneuver the pack, producing their own VGA chips that were faster than everyone else's. But as R & D moved from computer companies to specialized firms that concentrated solely on VGA performance, Compaq was, in effect, outgunned. I've also done some testing of cache performance on a wide variety of machines. Compaq has one of the best-implemented cache designs, with a hit rate that exceeds most of its competitors by a factor of 2 or more. (How typical of Compaq to have done all this work and to have forgotten to tell its customers! Perhaps Compaq thought they would take it for granted.)

Today, one of the most exciting developments in motherboard design is the rise of the "local bus." CPUs and peripheral devices (disk, VGA, network) have gotten too fast for the ISA (Industry Standard Architecture) expansion bus. So, increasingly, these devices join memory in being attached directly to the processor bus as PC manufacturers wait placidly for the chip set and motherboard designers to give them new products to integrate.

UNFORTUNATE CONCLUSIONS

Meanwhile, Intel, AMD, and others are putting more functionality onto their CPUs. Today, a cache. Tomorrow, a motherboard controller. Single-chip PCs aren't for everybody, but they will drive prices down, especially at the low end.

There is a downside to all this: As R & D spending moves upstream to the chip manufacturers, it moves away from users. We can only hope that performance doesn't take a back seat to mass-produced reliability. There's still plenty of room for differentiation in this business. ■

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John C. Dvorak



The Dead-End Trend

Avoiding the wrong technologies is as important as choosing the right ones for your company. Dvorak shows you how.

The trends that will dominate this decade are starting to emerge as new products and technologies are debuted. Luckily, the obvious trends are easy to spot. For example, it's hard for any of us to deny the trend toward the graphical user interface (whether we like it or not) and the trend toward faster, cheaper processors (which we all like). Harder to spot are the dead-end trends, the ones that will cost you money and prestige if you get suckered into believing they are real. Here are a few you should watch.

1. Oddball cheap high-speed modems using proprietary techniques. The International Telegraph and Telephone Consultative Committee (the CCITT) has taken over modem standards, and if the manufacturers don't adopt V.42bis, V.32bis, and other committee-inspired edicts, then they will die a miserable death. It's unusual for committees to be so dominant, but in this case it has happened. I think the entire MNP line of protocols will also be doomed by the CCITT.

2. Passive-matrix LCD color screens. Here's another technology that exists simply because it's cheap. Unfortunately, it has no future. Active-matrix technology will blow it out of the water.

3. Infrared-based networking schemes. There is a push by some companies to produce an infrared networking system using reflectors and repeaters and all sorts of gizmos to make it work. More likely, radio-frequency (RF) schemes will take over where cables left off. Infrared is dead.

4. Floppy disk drives in laptops and notebook computers. This is a riskier prediction, but I don't see any evidence that notebooks or laptops need a floppy disk drive. It adds weight and expense while shortening battery life. The *only* reason you need a floppy disk drive is so you can make a disk for someone. But why do you ever have to make a disk for someone in this day and age? Send your friend a binary file over a direct link or through CompuServe. Laptops will eventually have a couple of PCMCIA card slots, a hard disk, and a couple of ports, but no floppy disk drive.

5. The 5.25-inch floppy disk drive. Do I have to be the first to say this? Here is a technology that is going nowhere. It peaked at 1.2 megabytes, while the 3.5-inch drive has moved to 4 megabytes and beyond. Servo-track units now offer a reliable 20 megabytes. Few machines even come with 5.25-inch drives any longer. The fact that most software is still distributed on 5.25-inch 360K disks is ridiculous. If all vendors distributed their software on 3.5-inch disks, the 5.25-inch drive would be gone overnight, and few would complain. Let's bury this drive in the scrap heap with the 8-inch floppy disk drive.

6. The video tube. By the end of the decade, the archaic video monitor based on a large vacuum tube will be history. While this seems like an obvious prediction, I have to admit that the tube makers have shown a remarkable staying power, equaled only by the hard disk designers, whose abilities are almost magical. Some of the high-definition TV tubes are phenomenal. But LCDs are the wave of the future, whether in the form of a large flat panel or an LCD projector.

7. Handwriting recognition. The major trend in Western society is bad penmanship. I sometimes can't even read my own handwriting. By the time handwriting recognition becomes viable, voice recognition (the auto-



matic typewriter!) will have already killed it. In the meantime, the keyboard will remain the input device of choice.

So post this list on your cork board, and refer to it over the next decade. You'll see how much money you've saved by avoiding these dead-end trends.

ILLUSTRATION: JACQUELINE MORGAN



JIM POWELL

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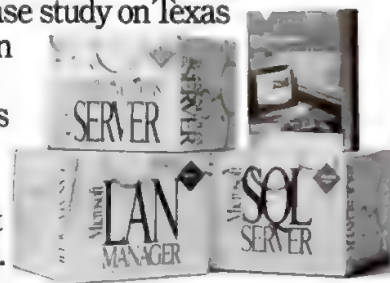
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Inside Track

If Windows applications are all **the rage**, and if Windows is **copied** after the Macintosh concept, then shouldn't Mac applications running on Windows be **better** than rewritten DOS apps? That's what Claris Software is thinking as it rolls out its esteemed Macintosh line, starting with *FileMaker Pro*, its highly regarded and best-selling DBMS.

There's an irony to this entry into the Windows world. **Claris Software** was a spin-off of Apple Computer's software division. At first it was destined to be independent and eventually go public with traded stock. Apple brought it back into the corporate fold about a year or so ago and made it a division of Apple. Apparently, Apple **feared** that Claris was about to take all of its excellent Mac apps and port them to Windows! Gads, now Apple is doing it instead. Look for a big Windows push from Claris this summer.

I Admire Microsoft Dept.: As many of you know, Microsoft is **under the scrutiny of the FTC** regarding (we think) unfair/monopolistic business practices. So when Mike Maples, head of all application development at Microsoft, made the statement that Microsoft wants to dominate the applications business and gave some high monopolistic figure, I thought that took a lot of moxie. But it doesn't end there.

Published reports followed with the news that Microsoft won't even pay **lip service** to Digital Research regarding the compatibility issues surrounding Windows 3.1 and DR DOS 6.0. I chalked up another point for Microsoft when I heard that one. Most companies would have at least put up a **smoke screen**. Obviously, Microsoft is more honest than that and prefers to stick to its guns regarding its practices. To me, it's almost as though Microsoft is publicly calling the FTC a **bunch of spineless wimps**. Boy, that's the kind of gall you don't see much anymore. Go get 'em, guys. Show up those government slackers!

Does Any of This Make Sense to You Dept.: IBM is putting the screws to many employees and laying off another 20,000 this year as it tries to regain its old foothold in the computer business. It has been reorganizing and reorganizing and reorganizing so much that one observer commented, "All they are doing just amounts to rearranging the deck chairs on the Titanic!"

One wacky maneuver is the creation of something called the PC Executive Board, headed by James Cannavino. This is somehow supposed to give the PC divisions some autonomy from the big bureaucratic machine at IBM. There are ten people on this board, which controls the so-called Personal Systems Division. In other words, it's like a union where

nine guys watch one guy dig a hole. Too bad light bulb jokes are no longer in vogue. I can think of a few while watching

the never-ending machinations at IBM.

Genuinely Interesting Software Dept.: *Automap*, the intelligent road atlas (After Hours, November 26, 1991), is a \$99.95 **killer of an application**. It allows you to make custom maps and route lists for trips you might take within the United States. The database includes details of over 359,000 miles of roadways as well as 51,921 cities. This would be a very cool thing to put onto a laptop for that RV trip into the mountains.

Out of the blue, I've had half a dozen people give me **unsolicited testimonials** about the value of this software package. People love it. It requires a hard disk and a mouse. Write or call Automap, 9831 S. 51st St., Building C-113, Phoenix, AZ 85044; 602-893-2400, (fax) 602-893-2042. Get a copy before you head out on that next vacation. You won't regret it.

Are You Glad to See Me or Is That a Radio in Your Pocket Dept.: Motorola is going around the country **showing off** its fascinating new wireless radio technology, which is designed to fit onto the next generation of laptop and notebook machines. Motorola thinks that cellular data communications will never achieve the

potential of these special transmitters, which **link directly** to the Ardis satellite network for transmission of data.

Eventually, the **entire globe will be encircled** by such birds in a grandiose scheme, making it possible to do point-to-point data communications anywhere on earth without a phone link. You just walk outside and punch up a comm program and pull out the antenna. The radio transmitter/modem is just a little bigger than a pack of cards. Unfortunately, Motorola is targeting large organizations such as Federal Express and others as the users of RF technology. I'd like to see the small companies and end users be the beneficiaries of such a scheme.

This technology falls into the category of operation called "bypass." **Bypass** is a phone company **buzzword** for any communications system that bypasses the phone company system to do something that the phone company could/should (pick one) do. It seems that the phone company will surely lose the field data transmission business because cellular is simply **too noisy, too often** to allow consistent, high-speed communication. I'm sure the phone company thinks about these issues and once in a while asks itself, "When the heck are we going to make the whole country an ISDN country?" **How long does the public have to wait** for the digitalization of the phone system? ■

IBM's been
reorganizing and
reorganizing and
reorganizing so
much, it's like
... rearranging
the deck chairs
on the Titanic!"

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Jim Seymour



Notebook Backups Made Easy

Whether you use floppy disks, the hard disk in your desktop PC, or your network server, don't forget to back up your notebook PC regularly. You'll be glad you did.

How do you back up the hard disk in your notebook PC? Ummm...you *do* back it up, don't you? Regularly...?

Many of us really rely on our notebook PCs; we assume they'll always be there, chugging away. And despite the abuse we subject them to, we somehow assume the data on their hard disks doesn't require the same care as that on the hard disks in our desktop PCs. Until that day when the hard disk in our notebook PC gives up, and we start screaming.

If the need to back up your notebook's data regularly isn't quite self-evident, neither is the best backup strategy. Yet protecting data stored on notebooks is actually easier than with desktop PCs—if only because of the variety of methods available for notebook users.

I've used several backup strategies for notebook PCs. A survey of staffers here at *PC Magazine* turned up other approaches as well. Here's our collective wisdom—how we do it.

The most obvious method of backing up your notebook PC's hard disk is, I think, among the worst: using floppy disks. This has the undeniable advantage of economy: If your machine has a built-in floppy disk drive, you may not need to buy anything more than a few boxes of floppy disks. Use the BACKUP/RESTORE tools in DOS or buy any of the several good backup programs that offer better performance and greater reliability.

But as cheap and convenient as using floppy disks may be, it may also be so inefficient that you keep putting off backing up until it's too late. And procrastination is the undoing of any good backup strategy.

A lot depends on your working style. *PC Magazine* editor-in-chief Michael J. Miller, for example, saves the newest files on his Toshiba T2200SX to a floppy disk every night when he's traveling. He finds security in keeping a second copy of his most recent work on a floppy disk in his coat pocket.

Not me. I don't like incremental backups, those daily or weekly nibbles that copy to floppy disks only the files changed or added since the last session. (That gradually pro-

duces what I find an unwieldy library of disks that's a nuisance to search through when doing an incremental restore.)

I prefer whole-disk backups: snapshots of the contents of the entire disk. I'd have to use a lot of floppy disks to back up the typical 20MB, 40MB or 60MB notebook-PC hard disk, and running that many floppy disks through a machine takes a *lot* of time.

That leads me to a second backup approach for notebooks, one that works well and is much, much faster. Instead of using a stack of floppies, why not simply back up your notebook to the hard disk on your desktop PC?

It's easy to set up a directory or partition on that deskbound machine's disk that is large enough to hold a full backup of your traveling machine's disk. Just create a directory called "portable," then dump the notebook's disk to that directory. This is so quick and easy with a file-transfer utility such as *LapLink*, you'll do it frequently. And if you can live with incremental backups rather than a whole-disk image backup, it can be *really* fast—just a minute or two each time.



ILLUSTRATION: JACQUI MORGAN

I concede two problems with this approach, as well as with most other office-system-based backup strategies: You don't have an immediate recovery capability while you're traveling, and if the disk on the desktop system goes down, your backup goes with it.

But I don't worry much about needing backups when I'm actually traveling; I *like* the security of knowing that my notebook's backups are safe and secure, back in the office. And the likelihood of *both* machines' hard disks crashing at the same time is very, very small.

A third approach to backup that I also like

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Jim Seymour

is very similar: On a regular basis, dump the contents of your notebook's hard disk to the file server connected to your office's local area network.

I can hear the screams from network managers: "Are you kidding? That would take up a huge chunk of our on-line storage! And what about bandwidth? I don't want users shipping 20 or 40 megabytes of data back and forth on the network all the time! It would slow to a crawl!"

Now, now. Not everyone on the network has notebooks. These backups can be run automatically at night, when there's little network traffic. And no one backs up and restores *that* often; you're not going to be doing this every day.

Finally, there's a network manager's responsibility to help secure users' data—all of their data. One benefit of a LAN is centralized backup; a nightly backup of everything on the server's disk(s) gives the network manager an up-to-date backup of users' most important desktop data. Why not encourage users' good habits by encouraging them to back up their notebooks' hard disks to a server—maybe to a separate, backups-only server?

(I know some of you will consider backing up to LANs heresy; no need to write....)

Yet another approach is to use Tranter's clever MiniSCSI adapter, which plugs into the parallel port of any notebook or laptop PC and adds a SCSI port, while passing through the parallel-port functions. This lets you dump the notebook's hard disk to any of many kinds of external SCSI devices: DATs, Bernoulli or SyQuest cartridges, the new 128MB minioptical drives, and more.

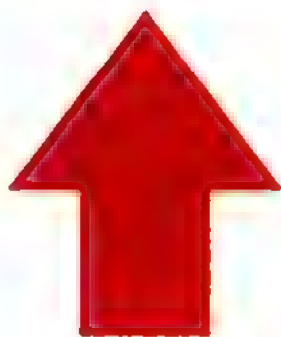
It's hard to justify buying one of those devices for backups for a single user. But buying one, and a stack of tapes or cartridges, as a dedicated notebook-backup system to be shared by a number of users in the same office makes a lot of sense.

Don't confuse notebook PCs' remarkable durability with indestructibility. Hard disks fail; hard disks subjected to the bounce-around existence of notebook PCs fail more often than those in desktop machines. When *yours* goes, you'll want a recent backup.

The question isn't *whether* to back up notebooks but *how*. ■

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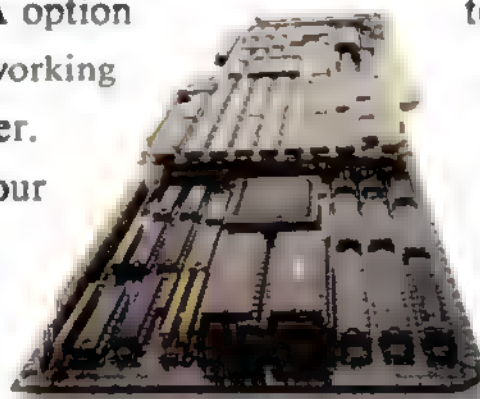
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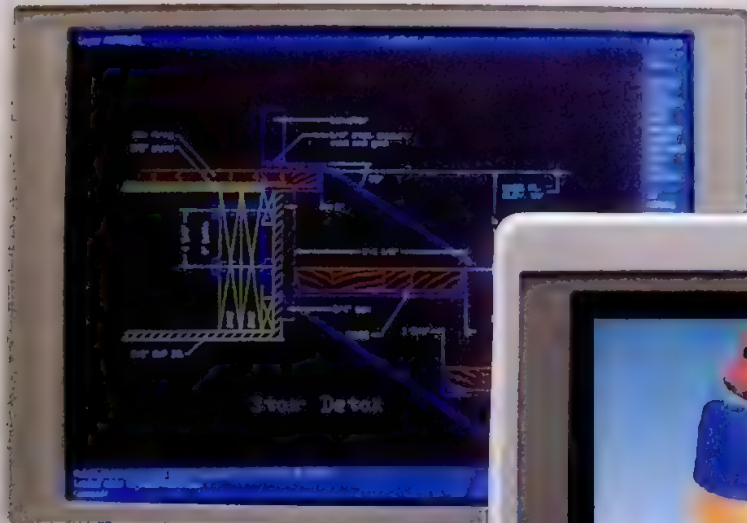
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CIRCLE 118 ON READER SERVICE CARD

William F. Zachmann



Blue Believer: Why I Still Think OS/2 Is a Winner

As the showdown grows near, our contrarian columnist casts his vote for OS/2.

It's getting close to "put up or shut up" time for OS/2. If IBM can't make good on its promises and deliver a solid product in the next month or so, then OS/2 will be the dead duck that many observers already say that it is.

That won't stop me from sticking my neck out one more time to say that I expect IBM will deliver OS/2 2.0 as promised. Furthermore, I expect that OS/2 will not only succeed but will take a lot of wind from Windows' sails in the process. I think OS/2 is the odds-on favorite to replace DOS as the dominant desktop operating system. Here are the reasons:

- The world is ready to move past the 16-bit world of DOS, constrained by single tasking and the limited memory space of the early Intel 8088/86. The decisive proof lies in the success of products aimed to overcome those lim-

its—from memory managers like *QEMM* and *386MAX* to multitaskers like *DESQview*. The success of DOS 5.0 and of DR DOS 6.0 has largely been due to the degree to which they overcome, at least partially, the inherent limitations of DOS.

- The world is also poised to move past the character-mode DOS interface to a graphical user interface that gives users the ability to manipulate objects on the screen—to get their work done in Apple Macintosh style.

- The world is not about to move to a 32-bit, preemptive, multitasking operating system with Mac-like features if people are forced to dump the software that they already use. Backward compatibility with both DOS and Windows GUI applications is required.

- Nor is the world about to move to a new OS that requires hardware capabilities only available to a small proportion of existing systems. An operating system that requires lots more processor speed, memory, and disk storage than the majority of systems presently installed won't go very far, very fast.

- Finally, the world is ready for an industrial-strength operating system that provides a reliable foundation for corporate information systems. As the market shifts from individual productivity to corporate systems, multimedia or pen-based bells and whistles are far less important than basic issues like reliability, availability, and serviceability.

Only OS/2 2.0 promises to deliver on all five criteria in the near future. If IBM merely keeps its promises, OS/2 will run on a 4MB 386SX or DX system from the majority of vendors. It will offer an industrial-strength, 32-bit, fully preemptive, multitasking operating system that overcomes the limitations of DOS while providing complete backward compatibility with both DOS and Windows applications.

What's more, the OS/2 2.0 workplace shell brings a graphical interface to standard Intel-architecture systems that is more Mac-like than anything Windows 3.0, 3.1, or NT promises. And it adds user-friendly innovations of its own, such as the use of pop-up menus on a right mouse button click.

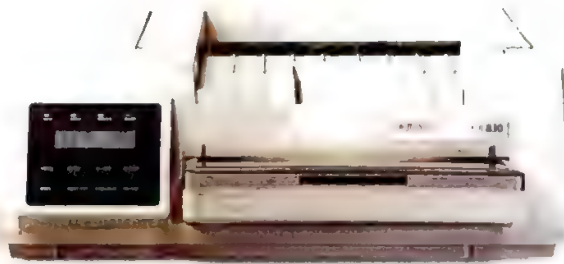


ILLUSTRATION: JACQUI MORGAN

Microsoft Windows 3.1 is rooted in DOS and in the limitations of DOS. Windows NT, while it promises much the same practical benefits as OS/2 2.0, is at least several more months away and will require a more powerful system—a system that, as of today, only a small minority of users own.

Add it up, and I see a big change toward OS/2 and away from Windows over the next year. If I'm wrong, I'll be the first to admit it. If I'm right, then the world of desktop computing will be much different a year from now than the present consensus anticipates. ■

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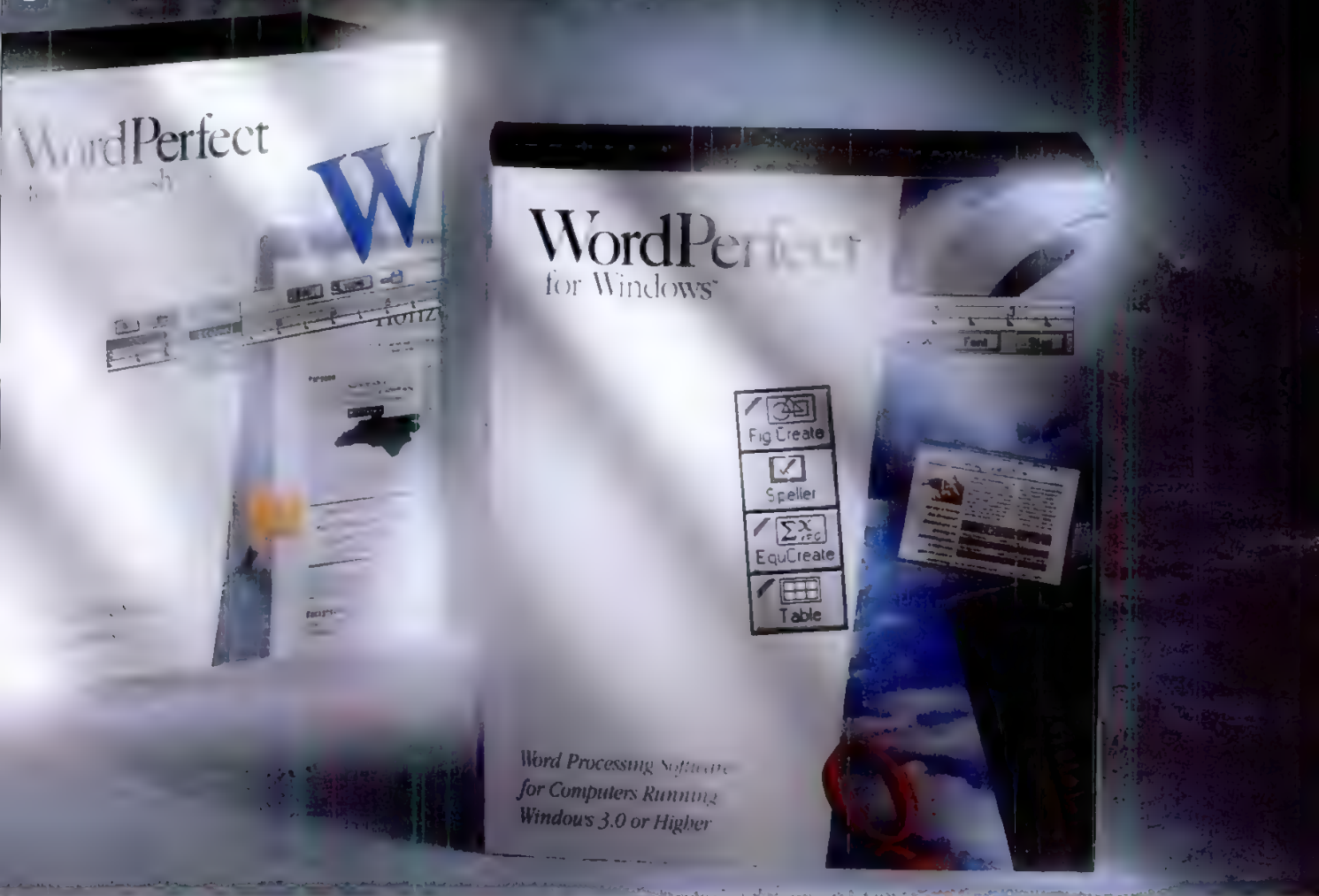
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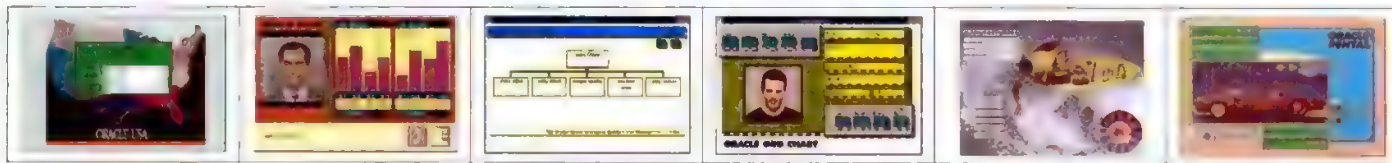
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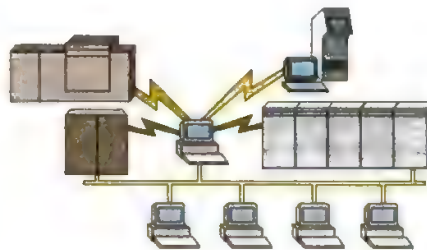
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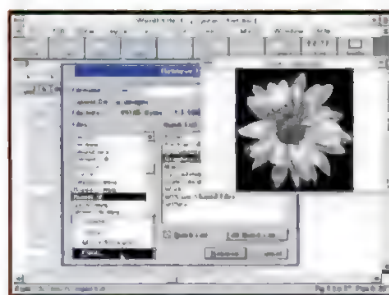
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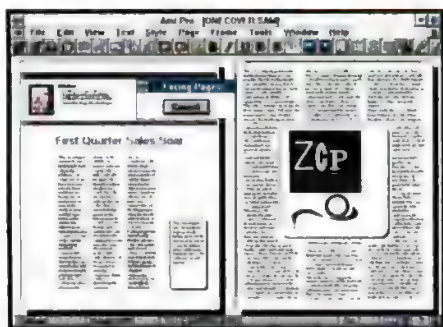
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Windows Word Processors

What You'll See Is What You'll Want

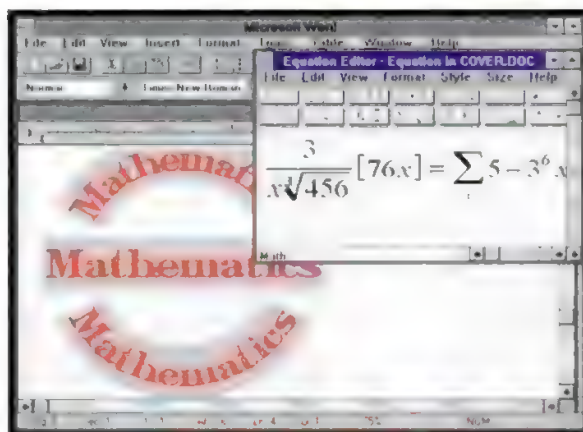
by Edward Mendelson



The second versions of *Ami Pro* and *Microsoft Word* for Windows, along with the first release of *WordPerfect 5.1* for Windows, take word processing under Microsoft Windows to a new, much improved level.

Second-generation Microsoft Windows word processors have arrived in the graphical world of WYSIWYG (what you see is what you get), and now you can see more and get more than you ever imagined. For the first time, Windows word processors have begun to surpass character-based programs in features and flexibility.

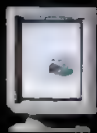
Graphical user interface (GUI) programs may never beat character-based word processors for raw speed, but the best Windows word processors have begun to narrow the gap. Only



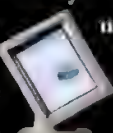


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CIRCLE 234 ON READER SERVICE CARD

two years ago, if you didn't use graphics in your documents, you probably didn't need a Windows word processor. Today, even if you never use graphics in your documents, you may find that only a Windows word processor can give you the power and customization that you need.

Here we evaluate seven Windows word processors priced from \$199 to \$495: *Ami Pro*, *DeScribe Word Processor*, *JustWrite*, *Microsoft Word for Windows*, *Professional Write Plus*, *WordPerfect 5.1* for

Windows, and *WordStar for Windows*. A new version of NBI's *Legacy* was not finished in time for testing, but a late prerelease version is previewed in the sidebar "Up and Coming in Windows Word Processing."

AUTOMATION:
THE REAL GUI ADVANTAGE
The first and most obvious innovation of Windows-

based word processors is their ability to manipulate graphics and page layout interactively, but the most significant innovation may have little to do with graphics. With the most advanced Windows word processors you can automate the creation and dissemination of documents to a degree almost unimaginable under DOS.

In the same office, using the same Windows word processor, expert users can automatically construct elaborate

THE OLE WAY TO CONNECT GRAPHICAL APPLICATIONS

by Edward Mendelson

Just when you were beginning to feel comfortable using Microsoft Windows' Dynamic Data Exchange (DDE) to move data between word processors, spreadsheets, and graphics programs, you are now forced to confront Windows' new data-transfer protocol: Object Linking and Embedding. This time you have less to worry about, though, because OLE is more intuitive than DDE and makes it easier to use your data without keeping track of where you created and stored it.

Let's say you want to use a *Microsoft Excel* chart in a Windows word processing document. With DDE, you switch from the word processor to the Program Manager, open *Excel*, create the chart, and copy it to the Clipboard. Then you return to the word processor, and use the Edit, Paste Link menu to add the chart to your document.

When both *Excel* and the word processor are running, changes made in the chart automatically appear on its linked counterpart in the word processor document. If *Excel* isn't open, you can double click on the chart in the word processor, and a prompt will ask if you want to open *Excel*. You can break the link between the chart file and the word processing document if you don't want to make more changes.

The linking aspect of OLE works almost identically to DDE. You paste the chart into a word processor, which supports OLE, by selecting the Edit, Paste Special command (instead of Edit, Paste Link). The chart is now a linked object in your document.

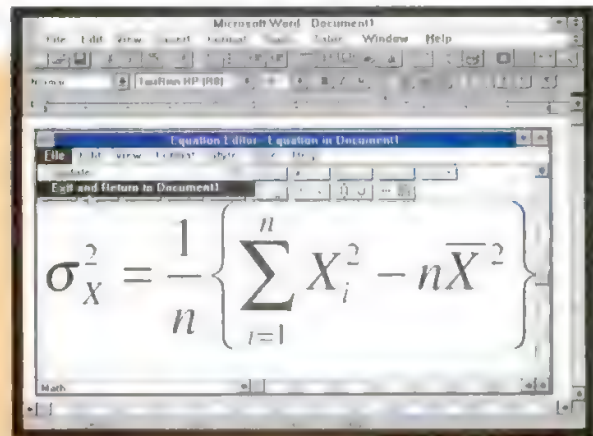
The embedding half of OLE is far more flexible. *Excel* needn't be opened to insert a chart. Just use your word processor's Insert Object menu, and choose the kind of object you want. This list includes the kind of objects you can insert, with names that don't necessarily match those in the original applications.

To create a chart, choose Excel Chart from the menu and *Excel* opens. When you close *Excel*, the chart is inserted in your document as an embedded object. It isn't saved as a separate file. Later, when you double-click on the chart in your word processor, *Excel* opens, lets you modify the chart, and then updates it in the word processor document.

MINI-APPLICATIONS

OLE has two additional twists. Programs can be designed to work only as *embedding* applications. This means you run them solely from inside a *destination* application whose documents can include the objects created by the embedded application. Unlike ordinary Windows programs, they can't be run separately. The mini applications that come with *Word for Windows*, Version 2.0, are embedding applications; they can be used with any application that supports OLE.

Also, you may be surprised when you embed a document created by *Ami Pro* or *Word for Windows* inside another document created by the same



When you exit the Equation application shown here, the contents of the screen are exported automatically into *Word for Windows* via OLE. You can't save the equation as a separate file.

programs. Instead of seeing the embedded document's text in the destination document, you see only an *Ami Pro* or *Word for Windows* icon; and you'll only see it when printing the page containing the embedded document. Although useless for printed documents, it can be very helpful on-screen. You can add words like "Double-click here for further instructions" just before the icon and let the reader use it to open a window on another document.

One problem with OLE is that it forces you to work in a separate window from the host document's when editing an embedded object. It's not easy, for example, to line up a chart caption with other text on the page. No one at Microsoft will say anything for the record, but the forthcoming OLE 2.0 specification, still in early planning stages, will let you edit the object in the same window you use for the rest of the text. You won't even be aware that you've opened a separate application to get the task done.

reports using data imported from remote locations. The reports are converted by the word processor into three-dimensional charts. Unskilled users can follow prompts and fill in dialog boxes to create a standard business letter and then sit back while the program prints the letter and envelope or transmits it via fax; all of this is handled by a macro.

Most Windows word processors let you edit text and graphics on an image of the page as it will emerge from the printer, complete with headers, footers, and footnotes. This capability is a mixed blessing. It's indispensable when you need to set up page layout and work with graphics, but when you enter text at the foot of a page, you'll find it distracting to watch the cursor vault across the bottom margin of the first page to the top margin of the next page before you can finish the sentence.

To be effective as a layout program and text editor, a Windows word processor needs at least two views: a WYSIWYG view that shows the full page and a draft or editing view that lets you enter text without wasting screen space on the top- and

bottom-page margins. And you shouldn't be forced to endure one of the unattractive Windows system fonts in the draft mode.

TWO CLASSES OF WINDOWS WORD PROCESSING

Windows word processors fall into two categories: full-featured programs and those with limited feature sets. Full-featured programs let you keep multiple files open at the same time, use recorded and programmable macros, and create and edit graphics. These programs can display both a fully formatted page and an editing view that suppresses top and bottom margins.

This high-end category includes *Ami Pro*, *Word for Windows*, and *WordPerfect 5.1 for Windows*. *DeScribe* has one foot in the full-featured door, but doesn't support important features like automatic footnotes and lets you edit text only in a full-page view, complete with margins.

Programs with limited feature sets let you edit only one file at a time and lack

macros, even if they have powerful and precise tools for typography and graphics. This category includes *WordStar for Windows*, with its drawing tools and text that flows between frames, and *Professional Write Plus*, which can import graphics but cannot create them. Both these programs let you edit either in full-page view or in an unformatted draft view that uses a Windows system font. This category also includes *JustWrite*, which only lets you edit in a view that displays one WYSIWYG page at a time.

OBJECT LINKING AND EMBEDDING

Because Windows word processors are written for a single integrated environment they can be combined with other applications to offer features you can't get from a word processor alone. Other Windows applications can even attach themselves to the menus of high-end Windows word processors like *Ami Pro* and *Word for Windows*, so you can use the word processor as a command center for importing and exporting data via Windows' Dynamic Data Exchange (DDE).



EDITORS' CHOICE

- *Ami Pro*
- *Microsoft Word for Windows*

Microsoft Word for Windows, Version 2.0, (\$495) is the superior graphical word processor for effortless work with text; it's fast, sleek, and rich in conveniences. *Word for Windows'* envelope printer is a marvel of automated efficiency, and its mail-merge is now so simple that the normally tedious task actually becomes enjoyable.

Word for Windows still has a few rough edges including a disastrous Compare Documents function, but overall it's a pleasure to work with. Its macro language is weaker than *Ami Pro's*, but it's still strong enough for flexible use in office automation. In the DOS world, dozens of vendors create add-ons that integrate well with *WordPerfect*. Under Microsoft Windows, all add-ons and third-party additions work with *Word for Windows* (although *Ami Pro* isn't far behind).

Ami Pro, Version 2.0, (\$495) is

also no slouch in text editing, but its best features are its graphics. It lets you create graphics, charts, tables, and equations in their true positions on the page, and it includes a brilliant set of drawing and charting tools. Its macro language allows more extensive office automation than is possible with *Word for Windows*, and for networks, it includes direct links to *cc:Mail* and *Lotus Notes*.

Ami Pro's performance lags slightly behind that of *Word for Windows*, but if Lotus gets the bugs out, *Ami Pro's* background printing feature will help you get back to work at top speed. The major disadvantage of *Ami Pro* is its handling of the screen. Unless you use its standard viewing mode, *Ami Pro* rewrites the current line of text whenever you pause, causing your text to shift suddenly. Make sure you can live with this screen behavior before you buy this program.

If you use DOS *WordPerfect* and you're not ready to move all of your word processing tasks into Microsoft Windows, *WordPerfect 5.1 for Windows* (\$495) gives you a smooth transition between the two environments. But under Windows, this first graphical version of *WordPerfect* lags behind *Ami Pro* and *Microsoft Word for Windows* in features, performance, and ease of use.

The best parts of *WordPerfect for Windows* are those that were written for Windows, such as the program's innovative file management feature and its button bar. Everything in the package that works like the DOS version seems awkward, including its unzoomable editing screen, its inability to let you edit a full-page image, its incomplete use of fonts and similar products, and its code-based formatting that seems awkward and archaic in a GUI environment.

The Ami Pro Upgrade: \$99⁹⁵!

The Number-One Rated Windows Word Processor.

Easier, Faster, More Creative.

Ami Pro has created a world of possibilities for the printed page. It is a pure Windows product, not a "ported" DOS counterpart. It features the visual power and easy-to-use nature of Windows 3.0 to produce top-notch results. Indeed, it established a new standard in word processing for the graphical user interface.

Now, version 2.0 breaks new ground with a rich visual environment along with an amazing array of easy-to-use tools at your fingertips. You'll write and format sophisticated documents you may have never attempted before because Ami Pro 2.0 is designed to work like you do, associating pictures and symbols — with concepts. Your ideas take shape faster and expressing them becomes easier.

That's the key: Ami Pro 2.0 is extremely easy to use. So easy to use in fact, that you can create crisp, professional-looking letters, reports, proposals and presentations the very first time you use it — even if you've never used a word processor before!

An Ideal Writing Environment.

Fast, Smart — and Visual.

Ami Pro 2.0 features fast outlining, easy revision marking, mathematical equations and even freehand drawing. You'll put together charts and tables with simple point-and-shoot action. You'll see your work with true WYSIWYG display.

You'll enjoy the built-in portfolio of style sheets and graphics-manipulation tools. Simply choose from pull-down menus to generate a table of contents, flow text around graphics, change fonts, colors and more. You'll select typefaces and move elements on the page easier than you ever thought possible.

Ami Pro 2.0 gives you the best spell checker in the business, a thesaurus with 1.4 million selections, a full macro language, interactive ruler, status bar, color palette and more. More than Word For Windows. More than WordPerfect.

Power Under the Hood!

Although Ami Pro 2.0 is a breeze to use (and use to its fullest), it possesses enormous power under its sleek interface. You'll seamlessly import and export files from WordPerfect, Microsoft Word, MultiMate, DCA, DisplayWrite, WordStar

and others. Ami Pro 2.0 contains over 120 one-click SmartIcons (matching those found in Lotus 1-2-3 for Windows) which make moving through Ami Pro 2.0 fun, and you can customize and arrange them any way you like. When was the last time you had fun with your word processor?

The Power to See...

Back to the power: Ami Pro 2.0 features a unique dialog box that shows you What-You-See-Before-You-Get-It right on the screen. Open and edit multiple documents at one time, see them in four editable view levels — all WYSIWYG and instantly "hot-link" to other Windows applications, including Lotus 1-2-3, with 2-way Dynamic Data Exchange (DDE). It all makes Ami Pro 2.0 easy to use — and that means professional results everytime.

Power Fields.

You can actually create entire documents — automatically — using this innovative technological feat. Power Fields are embedded commands that, typed directly into a document, enable it to perform a task automatically. For example, a business letter can request the input of a name, look up the address from another file, automatically place the name and address on the page in a pre-defined format and include various paragraphs or passages depending on the data provided. A power field could also be used to check the state or zip code in the address and determine whether a local or toll-free phone number should be included in the body of the letter.

Why Run Windows 3.0 If You Don't Make Use of Its Power?

Whether you're an executive who types only occasionally, or a heavy user who demands a long list of specialized features, you'll achieve impressive results with Windows 3.0 and Ami Pro 2.0. Occasional users are out of the chute faster because Ami Pro 2.0 is easier to learn and use. Heavy users enjoy features they can't find anywhere else, like tables that allow you to perform math, automatically create charts and graphs (easily import data for charts from spreadsheets with 12 styles to choose from), draw, employ its Dynamic Data Exchange capabilities with other Windows applications and even create documents using its powerful style sheets.

Have You Always Found Mixing Text and Graphics Difficult?

Who hasn't? But you'll actually have fun doing it with Ami Pro 2.0. Today, with most businesspeople drowning in paper, your documents need the snap that graphics provide. But you've always had to wrestle with different formats, complex import commands and then work for hours to position your images within your text.

Ami Pro 2.0 takes a far more enlightened approach. It includes a set of style guides that you can use to quickly put together ads, multi-column newsletters, brochures, letters, reports, presentations and even your everyday correspondence.

With Ami Pro 2.0's graphics handling features (and using its "frames"), inserting graphics is just a mouse-click away — in exact position, exactly the way you want them. No other word processor or desktop publisher under any platform makes it as easy for you to look good in print.

Word Processing Features:

- Text attributes: font, alignment, spacing, normal, bold, italic, underline, upper



The ultimate word processor — complete with easy-to-use desktop publishing tools for stunning newsletters, reports and more. Perfect for everything from a short memo to a comprehensive book.

- case, lower case, initial caps, small caps, superscript, subscript, double underline, strikethrough, overstrike character and protected text.
- **Editing functions:** undo, cut, copy, paste, dates and bookmarks.
- **Annotation:** footnotes and non-printing notes.
- **Paragraph control:** font, alignment, spacing, page breaks, special effects (leader text, bullets, outline numbering), lines and hyphenation.
- **Page formatting control (layout):** margins, tabs, columns, page size & orientation, lines, headers & footers, page & line numbering, & page breaks.
- **Document views:** four pre-set view levels and one variable view level.



Racing Highlights

Ferrari Unleashes V-12

Ferrari's new V-12 engine, which debuted in the release of a new Ferrari 288 GTO, is the most powerful ever produced by the Italian manufacturer. The engine, which is 1.8 liters in displacement, produces 280 horsepower and 200 lb-ft of torque. It is the most powerful engine ever produced by Ferrari.



Grand Prix Coming Soon To Las Vegas

The Grand Prix of Las Vegas is set to take place on the Las Vegas Strip. The race will be held on a temporary track that will be built for the occasion. The race is expected to draw a large crowd of spectators.

Welcome New Racing Association President

The National Racing Association has welcomed its new president, Mr. John Doe. Mr. Doe has a long history in the racing industry and is expected to bring new initiatives to the association.



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RATING THE PRODUCTS SUITABILITY TO TASK

Ami Pro and Microsoft Word for Windows outshine their competitors, but WordPerfect 5.1 for Windows proves to be the package most suitable for creating long documents.

Letter/memo evaluates the program's macro language, its templates (style sheets), and the completeness of its mail-merge function, including label printing.

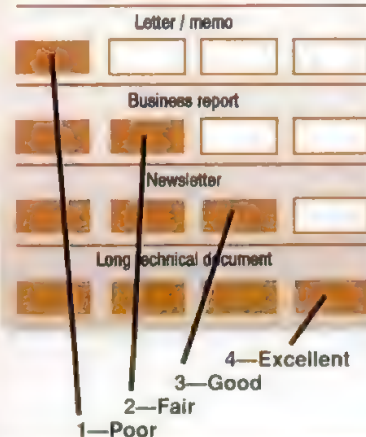
Business report assesses the program's ability to import graphics, create a bullet list, set up dynamic links to spreadsheets for both data and chart updates via DDE and OLE, spell-and grammar-check, create and edit tables, and facilitate redlining and group editing.

Newsletter evaluates test-column layout flexibility, text flow, preview modes, font-spacing features, importing, and editing of .EPS and TIFF graphics files. It also tests the program's drawing tools, if they are included with the package.

The **long technical document** task more rigorously tests the program's templates, including the creation of styles for headers/footnotes, tables of contents, and indexes. Other considerations include file management, which allows creation of master documents, subdocuments, and wide-area searches, as well as manuscript preparation features such as tables of contents, indexing, automatic cross-referencing, equation editing, collapsible outlining, and footnote/endnote creation.

SUITABILITY TO TASK

Product Name



You can pull down a menu in *Word for Windows* and run Mead Data Central's *Lexis 2000* to download data from the Lexis/Nexis on-line service and import it into the word processor. The same menu could let you run OCR software like Caere Corp.'s *OmniPage for Windows* or Calera Recognition Systems' *WordScan for Windows* to scan in text. And when you're through with your file, you can select menu items that send faxes via Alien Computing's *FAXit for Windows*, and keep track of your contacts with Polaris Software's *PackRat*. You can transfer data among Windows programs manually via the Clipboard, and *Ami Pro* and *Professional Write Plus* have links to e-mail so you can transfer files around a network without leaving your word processor.

DDE lets you transfer data from a spreadsheet program to a word processor, and it will automatically update the data in the word processor when you change the data in the spreadsheet. To revise spreadsheet data, you have to keep the spreadsheet file on your disk and open the spreadsheet program to make the changes.

A newer and easier way to exchange data between Windows applications is Object Linking and Embedding (OLE). To use OLE, you insert an *object* created by another application in your word processor. Once the object is in your file, you don't even have to remember the name of the application that created it; you just click on the object, and the other application opens and lets you make changes. When you close the other application, the object is updated in the word processor file. There's no need to maintain the object in a separate file. (See "The OLE Way to Connect Graphical Applications.")

ARE THEY ALL THE SAME?

Most DOS word processors differ dramatically from each other in their command structure and the way they format a page. On the other hand, most Windows word processors work in similar ways that go much deeper than a shared menu structure. With the notable exception of *Microsoft Word for DOS*, most character-based programs apply formatting by inserting codes. These codes determine the format of the document from the position of the code to the end of the file or to a code that applies a different format, whichever comes first. In most Windows programs you apply formatting by selecting a block

of text and applying a format that affects only that block. You don't have to insert codes.

Most Windows programs also apply formatting through styles—another feature they inherited from *Microsoft Word for DOS*. A style (in the usual word processing sense) is a repeatable set of formatting commands applied with a few keystrokes to the current paragraph or to selected text. It can specify line spacing, margins, alignment, paragraph font, and the space before or after the paragraph and the lines around it. Some programs let you turn hyphenation on and off in a style. To change the formatting of all text formatted with a style, you merely have to change the definition of the style; you don't need to insert or modify codes throughout the file.

Not all programs implement styles the same way. The easiest styles to modify are hierarchical. This means that special-purpose styles like subheads can be based on a more general style like normal text. If you change the font of the normal text, the font of the subhead and all other styles based on the normal text change automatically. The least effective styles are those applied by inserting codes before each affected paragraph, instead of by selecting multiple paragraphs and applying a style.

All Windows word processors include a spell-checker, and some now include grammar checkers. Depending on the way you work, some spell-checkers will be more convenient than others. If your files include many proper names or other uncommon words, you'll want a spell-checker that defaults to the Ignore-this-word option when you press Enter. If your files include few proper names, but you make a lot of typing mistakes, you may be better off with a spell-checker that defaults to the Replace-with-this-alternative-word option.

AUTOMATION THROUGH MACROS

One common way to automate a word processor is through mail-merge. All Windows word processors include a merge function, but only a few let you program the merge. A programmed merge can be as simple as one that prints letters only to addresses in Nebraska, or as elaborate as one that uses different text and graphics depending on the size of the *amount due* field in the merge data. The best Windows merge functions prevent you from mistyping a field name by letting you select field

names from a menu, and even let you program a merge from a menu by giving you a selection of Boolean operators to choose from.

The other way to automate a program is through macros. Unlike most DOS word processors, Windows word processors don't record keystrokes when you record a macro; instead they record the final result produced by your keystrokes. This makes it easy to program a macro, but hard to record ones that open a menu that displays the word count, because you have to close the menu before you can stop recording the macro. The final result is that you're back where you started, and the macro you carefully recorded does nothing at all.

The evaluations in the following pages survey these programs' abilities to handle large documents and to insert or create graphics. One crucial feature for handling large documents is the *master document*, which contains smaller documents you can edit separately but can be combined in the master document for creating indexes and tables of contents. The index and table of contents features should include easily customizable formats. Indexes should be able to include references that span multiple pages, in the form "11-15".

DO YOU HAVE THE HARDWARE?

If you already use a Windows word processor, you know the GUI advantages. But if you use a DOS word processor, you may wonder whether you should switch at all. In corporate settings, Windows allows a level of automation, customization, and standardization that makes it more of a necessity than a luxury. But you shouldn't attempt to use Windows without the proper hardware. You'll need at least a 386 SX and 2MB of RAM. A more realistic minimum if you want tolerably quick performance, is a 25-MHz 386 machine with 4MB of RAM.

If you have the hardware, you should almost certainly buy a Windows word processor and use it alongside of your DOS package. All of these programs can import and export files in most major DOS formats. The conversions aren't perfect (except between *WordPerfect's* Windows and DOS versions, which use the identical format), but they're good enough for simple documents. *JustWrite* and *Word-Perfect for Windows* automatically save files in the format in which they were first imported.

If you need speed above all else, keep

a DOS word processor on your disk. A character-based program may also make it easier to think about content without being distracted by format. But if you care about formatting and automation, you may find that one of the Windows programs evaluated here is the program you've been waiting for.

Ami Pro

Think of a task you want your word processor to perform, and *Ami Pro*, Version 2.0, can probably do it with less effort than you imagine. Lotus Development Corp.'s \$495 package was the first truly intuitive Microsoft Windows word processor, and the current version is more flexible than ever. Behind its simple menu structure, *Ami Pro* conceals an unparalleled range of conveniences.

In addition to stylesheets, collapsible outlines, support for long compound documents, and the richest macro language of any Windows word processor, *Ami Pro* offers charting, tables, equations, drawing, and tools for enhancing imported halftones. *Ami Pro's* seamless integration of graphics functions and text editing is unique. You can create graphics and text in the same window; the same fonts you use for text can be rotated and modified in graphics; and the drawing tools are the same ones you use to modify a chart.

VIEW IT YOUR WAY

Ami Pro displays files in either a full WYSIWYG layout view or a highly readable draft view that displays only text but

uses the same fonts as the layout or outline views. The layout view, which can be zoomed from 10 to 400 percent, displays only one page at a time (you can see facing pages in an uneditable preview), but it displays optional line numbering and lets you edit headers and footnotes in their true position on the page; to create a header you simply click in the top margin and start typing. Layout view also displays frames, which can contain text or graphics.

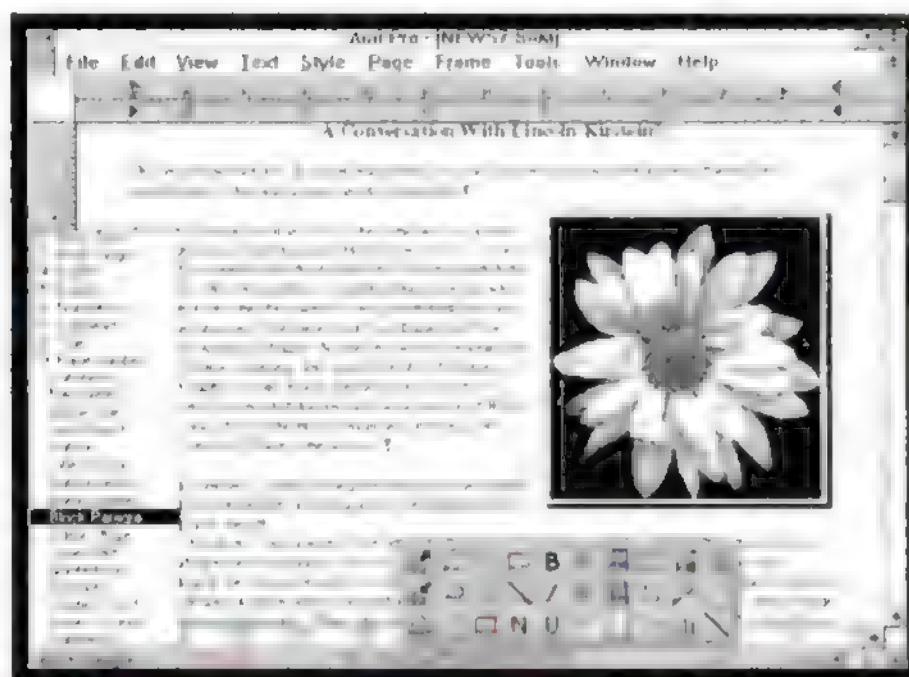
Among the optional elements on *Ami Pro's* screen is a space-saving ruler that, when you click on it, expands to display tab icons and a field for setting the number of text columns. You can also display Lotus's unique SmartIcons (small, sometimes baffling images that give one-click access to major functions) and create or import graphics to use as macro icons. The SmartIcon palette can be placed anywhere on screen, even outside the program window.

A status bar includes fields indicating the current style, font, and point size; click on one of these fields and a list of other available styles, fonts, or sizes pops up. Another field on the status bar lets you toggle the keyboard mode from Insert, to Typeover, to a mode that marks revisions.

MANAGING YOUR STYLE

Ami Pro's style management gives almost effortless control over all major formatting, though without the elaborate typographic control available in *DeScribe Word Processor*, *WordStar for Windows*, or *WordPerfect 5.1 for Windows*. You can base a style on formatting applied directly to a paragraph or build a style from an elaborate menu that displays a preview of choices.

If you specify additional spacing above



In full regalia, *Ami Pro's* screen can display graphics, borders, SmartIcons, vertical and horizontal rulers, and lists of styles, fonts, and point sizes that pop up from the status bar. Other fields on the status bar display date and time and let you toggle SmartIcons on and off. If you click on the horizontal ruler, other format-control icons appear.

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not available.*



*HP LaserJet III printer:
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PRINTERS. PAGES AHEAD.

or below a paragraph, the program can be set to omit the added space at page or column breaks. Rows in tables can span page breaks to create true multipage parallel columns with flowing text—something possible only with *WordPerfect for Windows*' parallel columns. Tables can also include arithmetic formulas and protected cells.

Ami Pro lets you move styles from documents to stylesheets and back more easily than any other word processor. Stylesheets can include text, graphics, and automatic macros. Styles are automatically assigned to function keys, but the rest of the keyboard can only be globally modified by assigning macro keys. Frame borders, shadows, and anchoring are controlled as easily as text—and you can even work effectively in frames without abandoning the keyboard for the mouse. Files can include nonprinting notes. If you use *cc:Mail for Windows* or *Lotus Notes*, you can send files directly from *Ami Pro*'s menus.

MAIL-MERGE AND MACROS

Mail-merge isn't as effortless as in *Word for Windows*, but a menu lets you enter up to three conditions for a programmed merge. If you use a *dBASE* or a spreadsheet file as data files, you also have to create an *Ami Pro* file identifying the format and field names. You can use *Ami Pro* to fill in preprinted forms by choosing an option that prints only unprotected text entered in the on-screen form. A document-compare feature displays the file's changes and deletions precisely, and you can also redline on the fly.

Ami Pro's macro language includes global variables and an option to disable screen updates in the window where the macro operates. Unlike *Word for*

Windows, *Ami Pro* lets you create dialog boxes that change in response to the user's actions. A \$9.95 macro developer's kit includes a huge manual and an improved version of the dialog box editor that comes with the word processor.

Among *Ami Pro*'s other features are a four-level Undo feature; the ability to open or iconize nine files with Windows' Multiple Document Interface; a free-hand tool and Bezier curves for drawings; OLE support, and customization of DDE links.

On PC Magazine Labs' speed tests, *Ami Pro* produced good to excellent results. Its unique background printing returned keyboard control five times sooner than any other program, and even with background printing turned off its print times were among the fastest. Its other scores were generally second to *Word for Windows*, except for a fast score on search-and-replace.

AMI OBSTACLES

Beneath its sleek surface, *Ami Pro* has some rough spots and inconveniences. Unless you use the standard view to display the full width of a page, the screen rewrites at the end of every line or whenever you pause, even if you tell the program to ignore true line endings on-screen. Some users may find this intolerable. Because styles aren't organized hierarchically, they can be tedious to modify after you create them. When you change fonts in the normal body-text style, fonts in other styles based on body text don't change automatically.

A supplied macro can change all the fonts in a stylesheet to a single typeface family, but this doesn't help if your stylesheets use two typeface families, one for text and another for headers. Text attributes are easily changed from the keyboard, but you can't indent a paragraph simply by pressing a key.

Because *Ami Pro*'s spell-checker is confused by ellipses and other unusual punctuation, it flags errors that don't exist. The spell-checker also defaults to Cancel, which forces you to use the mouse or an Alt key after each flagged word. You can't get a word count without updating the document statistics screen or a field.

MASTER DOCUMENTS

Ami Pro's master documents aren't files that contain both text and other files as in



FACT FILE

EDITORS' CHOICE



Ami Pro, Version 2.0
 Lotus Development Corp., Word Processing Div., 5600 Glenridge Dr., Atlanta, GA 30342; 800-831-9679, 404-851-0007.
List Price: \$495.
Requires: 1MB RAM (2MB recommended), DOS 3.0 or later, Microsoft Windows 3.0.
In Short: *Ami Pro*, Version 2.0, sets the Microsoft Windows standard for visually impressive word processing with virtually every feature necessary for corporate and personal editing. Graphics, tables, equations, and image enhancement bring *Ami Pro* close to the level of many desktop publishing packages.

CIRCLE 467 ON READER SERVICE CARD

Word for Windows or *WordPerfect*, but lists of files from which you create cross-references and extract a combined index or table of contents. You can, however, use fields to insert files manually into other files. Text can be entered into the master document, but you may be surprised when it doesn't print. Indexes, even for a single document, have to be saved in a separate file. You can't automatically create index entries that span multiple pages.

Ami Pro's background printing option speeds printing by formatting files for the printer while you get on with your work. Unfortunately, the option that makes this option possible tends to crash. Some .PCX files that *WordPerfect* and *Word for Windows* easily import and print cause a crash after printing in *Ami Pro*. You can have portrait and landscape pages in the same file, but unless you print them separately, they all have the same orientation on the printed page. To print the current page you must fill in its number on a menu.

If you don't need everything in *Ami Pro*, you can get a \$199 reduced version called *Lotus Write*, with the same outlining, thesaurus, mail-merge, and MDI support for the larger version but without graphics manipulation. *Lotus Write* files can be edited in *Ami Pro*, but complex

SUITABILITY TO TASK

Ami Pro

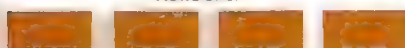
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Business report



Newsletter



Long technical document



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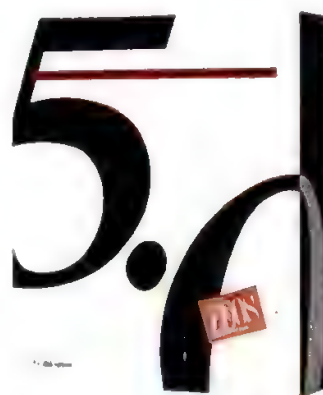
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Ami Pro files can't be edited in *Lotus Write*.

Ami Pro dazzles the eye and excites the imagination. It lacks some of the conveniences and subtleties of rival programs, and some of its features can't match the most advanced powers of *Word for Windows* and *WordPerfect 5.1 for Windows*. But no other Windows program matches *Ami Pro*'s macro language, fields, or its integrated design; and no other program lets you accomplish so much with so little effort.

DeScribe Word Processor

For better or for worse, *DeScribe Word Processor* breaks all the rules. *DeScribe*'s \$495 hybrid word processor and desktop publishing package for Microsoft Windows and OS/2 (both versions come in one box) looks and acts like no other program on the market. It's a pure WYSIWYG program, with advanced features that you won't find anywhere else. But you also won't find the simple functions you take for granted in other programs. For example, *DeScribe* can support complex two-way DDE links, yet it's unable to count the words in a file.

After one session with *DeScribe*, you may not want to return to programs that lack features like its infinite Undo feature, which can replay every keystroke in the current session. *DeScribe*'s Undo can restore a file to the state it was in an hour ago, or let you pluck a block of text from an earlier state of the file and paste it into the current state. But you may wonder how a program that displays such spectacular innovation

can also be so clumsy sometimes.

DeScribe's menus and keyboard layout differ radically from every other Windows program, so much so that you have to retrain your fingers merely to open a file.

DeScribe displays files only in page-layout mode. You can zoom from 10 to 500 percent of a document's actual size, but even if you set the zoom level to keep the left and right margins out of the screen, you can't keep the top and bottom margins off the screen when you edit near the top and bottom of the page. Thumbnail views display multiple pages in a single column down the right side of the window.

UMPTIEN OPEN FILES

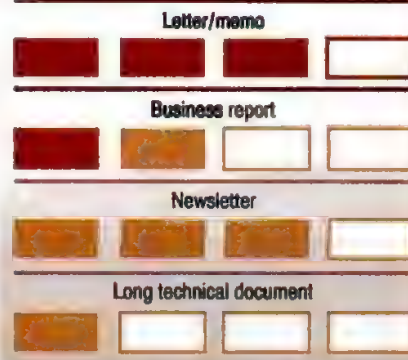
DeScribe lets you open and iconize as many files as your RAM and system resources allow; I stopped trying at 18. It can open multiple windows on the same file, and each one can display a different part of the file at a different zoom level. Changes you make in one window appear instantly in all others. Compared with *DeScribe*, no other Windows program lets you view as many files or see the same file in as many different views.

DeScribe's documents start with the formatting built into Layout files that resemble the templates and stylesheets of *Word for Windows* and *Ami Pro*. Fifty Layouts come with the package, and you can modify them or design your own. A Layout can contain styles, formats, text, and frames, which *DeScribe* calls Objects. Objects can contain text, imported graphics, or drawings created by built-in graphics tools, which include Bezier and fillet curves, but lack a freehand tool. Graphics Objects can float with the para-

graph they are attached to, and text can flow around one, but not both sides of an Object.

You can flow text from an Object on one page to an identically placed Object on the next page, but not between two Objects on different parts of a page. *DeScribe*'s Objects are often awkward to work with: Each Object needs a unique name before you can use it, and you have to remember obscure combinations of Shift, Ctrl, and mouse clicks to move or resize an Object using the mouse.

SUITABILITY TO TASK DeScribe Word Processor



TEXT CONTROL

DeScribe lets you format text with predefined styles, direct commands, or a floating toolbox that looks like *Word for Windows*' ribbon. You organize styles in a hierarchical tree-structure that resembles a directory tree. The styles in a book layout might include a top-level style for the whole document, and lower-level styles for title pages, chapters, and indexes.

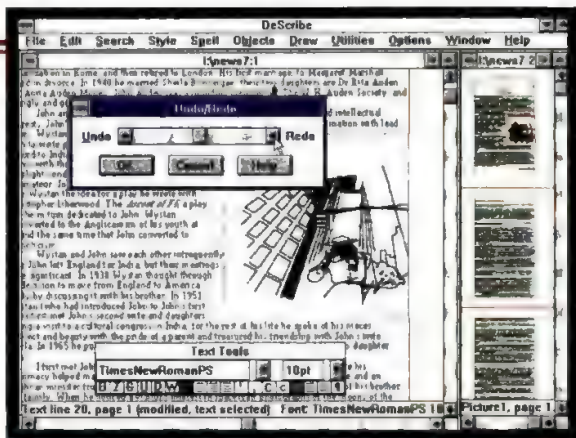
Styles can include exact settings for kerning, letter spacing, and word spacing. *DeScribe* can automatically turn off justification on lines with only one word so they won't be too widely spaced. You can specify the size and distance of an underline and even create customized drop capitals.

You can create elaborate formats for tables of contents and indexes, but you can only create footnotes or endnotes manually, without automatic numbering. *DeScribe* has no built-in outlining, but it supports tables (without math) and snaking columns.

NONSTANDARD KEYSTROKES

The better you know Windows, the more you'll be frustrated by *DeScribe*'s menus

DeScribe Word Processor's infinite Undo feature lets you play back all of your text editing during an entire session by simply moving the slider. This screen shows the program's ability to display multiple pages in reduced view while letting you work at full scale in another window. A click on the right mouse button deactivates the text tools.



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DeScribe Word Processor, Version 3.0
DeScribe Inc., 4047 N. Freeway Blvd.,
Sacramento, CA 95834; 916-646-1111.
List Price: \$495.
Requires: 4MB RAM, DOS 3.1 or later,
Microsoft Windows 3.0 or OS/2 1.2 or later.
In Short: DeScribe Word Processor, Version
3.0, works differently from most other
Microsoft Windows word processors, but
includes a unique infinite Undo feature that
can replay a full session. It lacks major
features like footnotes and suffers from a
spartan interface, but it allows exceptional
refinements in formatting.

CIRCLE 468 ON READER SERVICE CARD

and keyboard. Pressing Alt-F simultaneously doesn't pull down the File menu. You have to press Alt and then F in two separate keystrokes. DeScribe lets you assign Alt-letter keys to recorded or programmed macros, but you can't write an Alt-F macro that acts like Alt-F in any other Windows program. (A promised upgrade will let you use Alt-F in a more standard fashion.)

Equally strange, Ctrl-Page Up and Ctrl-Page Down scroll the screen horizontally, not vertically. Ctrl-Del, a key-combination not mentioned in the manual, deletes to the end of the line, not the current word as in most other programs. (WordPerfect for Windows shares these dubious key mappings.)

DeScribe's technical support says that all functions are accessible with the keyboard, but many paragraph style menus can't be used without a mouse. The powerful Undo feature is also awkwardly implemented: when you select Undo you open a dialog box with a slider bar that you have to move, even if you merely want to undo your last action. Help, based on a nonstandard help engine, is highly detailed, and you can attach custom help screens to menus.

INNOVATION, FRUSTRATION

Typical of DeScribe's mix of innovation and frustration is a Search/Replace menu

that lets you search or replace two strings at once, yet defaults to a case-sensitive search every time you use it. The spell-checker defaults to Replace rather than Ignore, which can cause you to insert unwanted words in your text.

The manual doesn't warn you that, as in every Windows word processor, the Undo memory clears whenever you save a file; you should rely on DeScribe's timed snapshot backups instead of saving. When you load the program after a system crash, a dialog box offers to restore the most recent snapshot.

Additionally, programming a mail-merge can be done by rewriting the macro that provides the function; data files use a nonstandard format with fields delimited by ^R—a supplied macro lets you type this finger-twisting pair of characters with one keystroke; you can't automatically convert other data file formats, and comma-delimited ASCII data files can only be used after creating a macro to convert them.

On PC Magazine Labs' speed tests DeScribe produced mixed results, with painfully sluggish scrolling and generally slow performance in most other areas. The program gobbles up system resources, making it difficult or impossible to run other programs at the same time.

DeScribe resembles a giant construction with many of the crucial pieces missing. If you have a pioneer spirit, DeScribe can offer spectacular features that you won't find anywhere else. But if you prefer the comforts, conveniences, and speed of a more finished program, look elsewhere.

JustWrite

For about half the price of a full-featured word processor, Symantec Corp.'s \$199 JustWrite, Version 1.0, offers much more than half the conveniences. If you want collapsible outlines, graphics imports, tables, support for eight open files under Microsoft Windows' Multiple Document Interface, bookmarks, snaking columns, spell-checker and thesaurus, customizable footnotes and endnotes, tables of contents and indexes, and DDE links to spreadsheets and graphics, JustWrite gives them to you.

While JustWrite lacks ambition—

offering no macros, redlining, drawing, or charting—it's very easy to live with. You don't have to remember arbitrary keystrokes to enter hard hyphens or hard spaces; you insert them from a menu. If you open a file in WordPerfect, DOS Word, or Word for Windows, it saves the file in that format. Its optional smart cut-and-replace option lets you define and manipulate blocks without worrying about inserting too few or too many spaces when you cut or paste words. The screen doesn't flash with type manager fonts. It's a program that's attractive to work in and simple to get to know, although it gets less attractive the better you know it.

SUITABILITY TO TASK

JustWrite

Letter/memo			
Business report			
Newsletter			
Long technical document			

DISPLAY AND DESIGN

All files are displayed in WYSIWYG page mode; you can't switch to draft mode, and most users will be frustrated by the program's refusal to display the text at the foot of the first page 1 and the top of the second on the same screen. Even the reduced full-page view displays only one page at a time. You can choose between a proof mode that displays only printed text and graphics, or a detail mode that displays nonprinting characters like tabs and line breaks.

The deeper you look in JustWrite, the less intuitive it becomes. For example, you customize tab settings from the Format, Paragraph menu, but you set default tabs from Format, Document. You specify a document's text font from Format, Character, but if you create an outline, the font used for numbering the outline won't match the font of the text until you specify an outline font on the Format, Section menu.

JustWrite displays all headers, footers, footnotes, tables, and graphics elements on its editing screen. But when you first

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COVER STORY GUI WORD PROCESSORS

create or import any of these and later edit them, the rest of your file disappears and you work in a separate window. You can import .PCX, TIFF, and other graphics, but the program rejects all images larger than 1,024 by 1,024 pixels—a severe limitation. You can create frames to insert text, tables, or graphics, and horizontal lines are created by drawing a single border above a thin, empty frame. As with a spreadsheet program, you enter text or numbers in tables by typing in a field at the top of the screen.

An optional paragraph bar on the left side of the screen displays small dashes to indicate paragraph breaks, numbers to indicate outline levels, and a vertical bar to indicate the current paragraph. Click once on the bar to select the paragraph; double-click and you number the paragraph as part of an outline. You can use the paragraph bar to move paragraphs or promote or demote outline levels.

At the top of the screen an optional format bar gives quick access to fonts, point sizes, and color settings, and has crudely drawn icons that control text attributes and paragraph formats. When you edit a table, the bar displays icons for selecting borders and lines for locating text at the top, center, or bottom of a cell. When you import a graphics image, the bar has tools that make the graphic fit the frame or maintain its original proportions during resizing.



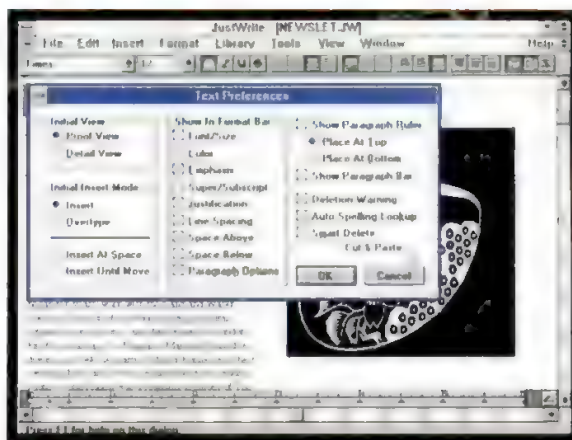
JustWrite, Version 1.0

Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 800-441-7234, 408-253-9600.
List Price: \$199.

Requires: 2.5MB RAM, DOS 3.1 or later, Microsoft Windows 3.0.

In Short: JustWrite, Version 1.0, is a low-end Microsoft Windows word processor that's easy to use for basic tasks, but it is recalcitrant and obscure when you attempt advanced formatting. Because of its slow performance and limited feature set, the best recommendation is its low price.

CIRCLE 466 ON READER SERVICE CARD



The Smart treatment in JustWrite is an option that can be set so you can cut, copy, or delete text. Smart treatment guards against bringing the surrounding spaces with copied or moved text and inserting extra spaces when you move text.

The mouse lets you select a word with two clicks, a sentence with three, and a paragraph with four; you can press the number pad 5 key once, twice, or three times for the same results. But JustWrite doesn't let you delete a word in one keystroke with Ctrl-Del or Ctrl-Backspace as in other programs. Automatic backup can be set to every 10, 30, or 60 minutes, but not to any other interval.

QUASI-STYLESHEETS

JustWrite's worst disappointment is its library feature, which looks like a style-sheet, but has little practical value. Here, a style is merely a one-step method for applying paragraph formatting, and you can't undo the text attributes of one style by applying another. If the first style you use makes the text bold and the second underlines it, the result is text that's both bold and underlined.

The spell-checker works slowly, and the menu defaults to Lookup instead of the more efficient Replace or Ignore. It doesn't recognize the hyphen as a separator, so words linked by single or double hyphens are flagged as errors. Confusingly, you have to choose a name for your user dictionary before adding words. You also have to spell-check a file to get a word count. JustWrite hyphenates on the fly, and you can add soft hyphens, but you can't modify the hyphenation dictionary.

JustWrite lets you link its own files with any text or graphics file in formats that it can import, including files created by programs that don't support DDE. Changes in the linked file can appear in the JustWrite file either automatically or on command. Mail-merge works directly

with dBASE, ASCII, and Q&A files, and you can enter merge fields from a menu when creating a primary file.

JustWrite performed PC Magazine Labs' scroll and search tests at top speed, but produced average results in other areas of testing. Its print times were especially fast, bettered only by Ami Pro's background printing mode. It uses system resources wastefully and may prevent you from loading other programs while you use it.

If you only need the basics, it's an easy program to use. But the basics should include the ability to edit the bottom of one page and the top of the next on the same screen, and JustWrite can't do that and much more that you probably want from your word processor.

Microsoft Word for Windows

When Microsoft Word for Windows first appeared, it combined industrial-strength word processing with industrial-style austerity in its screens and menus. Now, in Version 2.0, this \$495 package wields all its original power—and more—behind a lucid and luxurious interface. Word for Windows still builds documents on the foundation of templates, which are super-stylesheets that can contain custom macros, keyboard layouts, text and graphics, as well as paragraph styles. It still packs its keyboard with ingenious shortcuts, and it still supports collapsible outlines and hidden text that you can choose either to display or conceal on screen, or to include

File Edit Worksheet

(C0) [W12]

A:E10

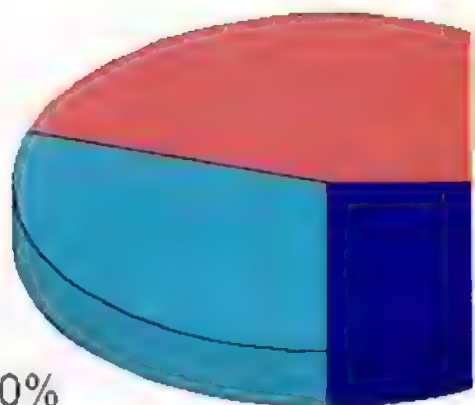
@SUM(B

	A	B
9		
10	Revenues	\$1,260,000
11	Costs	\$850,000
12	Profit	\$410,000



Market Share

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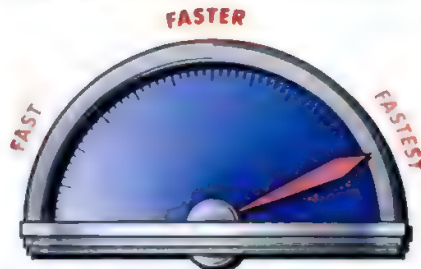
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Why ZEOS is

✓ Now, your ZEOS modular system allows you to upgrade from one CPU to another as your computing requirements change. Obsolescence is virtually obsolete!

✓ You may choose between a variety of '386 and '486 processor options, both cached and non-cached.

✓ Made in USA! Your new ZEOS system boards are designed and manufactured by ZEOS, right here in the USA.

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CHECK YOUR EXCLUSIVE

If you're deciding which new computer to buy, there are many important considerations.

Here, we've gathered together a number of these considerations for your review. Some are of obvious importance,

**ZEOS.
Eight Times
Editor's Choice.**

✓ Eight slots, one for the video, seven more open providing plenty of room as your system requirements grow.

✓ Two high speed serial ports, one parallel port and one game port.

✓ Our top quality 300 watt power supply provides you with plenty of power for your present *and* future needs.

✓ ZEOS uses *only* genuine Teac* floppy drives. Accept nothing less.

✓ Monochrome TTL systems feature Genuine Hercules* brand graphics controllers. Only the best for you.

Your #1 Choice!

ZEOS ADVANTAGES:

while others are subtle yet critical to your ultimate satisfaction. We'll go over them here with you one by one.

Please feel free to use these as a basis for comparison with other system vendors. We believe you will come away with the conclusion that ZEOS is indeed Your #1 Choice.

✓ VGA color systems feature the high-res ZEOS 1024x768 Non-interlaced monitor with the incomparable Diamond SpeedStar Hi-Color card with 1MB RAM and Sierra DAC (32,000+ colors)!

✓ Special package savings are available incorporating our most popular upgrades. Many packages include Microsoft® DOS plus Windows and a Mouse!

✓ For a limited time every ZEOS Windows system also comes with Lotus 1-2-3 for Windows plus Lotus' incredible new Windows word processor *Ami Pro 2.0!*

✓ *PC Magazine* said ZEOS offers "more options than even the most configuration hungry hound could possibly need." Let us build whatever you require.

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✓ ZEOS systems have been selected by *PC Magazine* as *Editor's Choice, Eight Times!* These, along with many other consumer and industry awards attest to ZEOS' consistent and outstanding value.

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✓ Friendly, knowledgeable ZEOS Systems Consultants are available 24 Hours a Day by calling 800-423-5891. You can call any time. When you add it all up, there's nothing like buying from ZEOS. There is certainly nothing like these new ZEOS systems!

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A married person may apply for individual credit. I am applying for (please check appropriate box):

- ☐ **JOINT CREDIT** with another person. Complete entire application.
- ☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
- ☐ **INDIVIDUAL CREDIT.** Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

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☐ married ☐ unmarried ☐ legally separated

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Name _____

Home Phone (_____) _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State ____ Zip ____

Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

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City _____ State ____ Zip ____

Employer _____ Since? (Mo./Yr.) _____

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Y/N How Many? Y/N How Many?

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Address _____ Apt. _____

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Date _____

Joint Applicant's Signature _____

Date _____

FOR MARRIED WISCONSIN APPLICANTS: I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

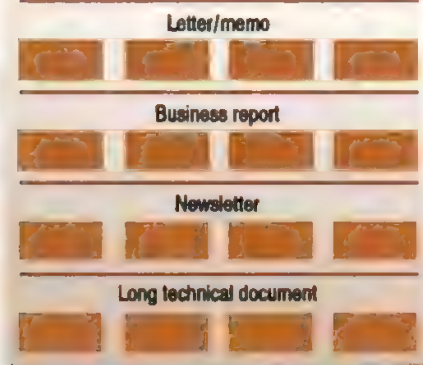
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There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

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*Financing not available in Alaska, Hawaii or outside the continental U.S.

SUITABILITY TO TASK
Microsoft Word for Windows

or omit from the printed page—a feature that lets you use the same file to produce documents of differing length and depth of detail.

But *Word for Windows* now does much more. It automatically finds the address in a letter and prints it on an envelope. It supports frames that can contain text, graphics, and other frames; and all can be moved or resized with the mouse. Unlike frames in *Ami Pro* or *WordPerfect*, *Word for Windows*'s frames can't be positioned in text like a character. *Word for Windows* comes with mini applications to create drawings, equations, and graphs that are automatically embedded in documents via OLE. It guides you through the maze of creating a mail-merge and automatically checks the integrity of merge data. It lets you edit and print portrait and landscape pages in the same file.

FRUGAL WITH RESOURCES

Word for Windows performed well on PC Magazine Labs' tests, with generally excellent results in all areas except printing, where it performed in the middle rank and was easily bettered by *Ami Pro*. *Word for Windows* shines, however, in its frugal use of system resources, a quality that lets it coexist easily with other Windows applications.

When you work at the keyboard, it has a uniquely fast and effective feel that's the product of its performance and its built-in shortcuts. You can create a hanging indent with one keystroke and remove it with another. In addition to finger-twisting combinations like Shift-Ins for pasting text, *Word for Windows* also gives you Ctrl-key combinations that will be standard in Windows 3.1.

Word for Windows' once laconic menus have changed into informative panels

complete with previews like those in *Ami Pro*. But some of its best features are hidden in the manual and help screens. The Go To menu lets you jump to lines, footnotes, and bookmarks as well as pages; to jump to a file's halfway point you can enter 50 percent. Function keys let you toggle capitalization, use *Word for Windows*' abbreviation-expanding glossary, and customize the display.

TEXT MANIPULATION

You can edit different parts of a document by splitting the window into what Microsoft calls panes or opening up to nine simultaneous windows on the same file. Changes made in one window appear in all windows. Nine files can be opened at once, but you can't iconize them because *Word for Windows* doesn't support Windows' Multiple Document Interface. You can search and replace fonts or any other attribute. A point-and-shoot menu lets you insert symbols from any font—but *Word for Windows* has no built-in keyboard shortcuts to insert symbols like those in *WordPerfect*. *Word for Windows*' spell-checker is quick and effective, and intelligently defaults to Ignore.

When you run the highly integrated grammar checker, the spell-checker runs simultaneously. You can insert soft hyphens, but can't hyphenate on the fly or change the hyphenation dictionary.

Word for Windows's editing screen has five distinct personalities. First, a normal view displays most text formatting and shows page breaks as a line across the screen; you edit headers and footnotes in separate panes. Second, a layout view lets you edit columns, graphics, headers, and footnotes in their true position. Third, an outline view displays an icon bar that lets you collapse or rearrange headings. You can zoom these three views from 25 to 200 percent. Type manager fonts flash distractingly in all of them. Fourth, you can switch to a reduced print preview to see line numbering and other features you can't see elsewhere. And fifth, a draft view uses the Windows system font and displays no formatting, but shows you the approximate position of frames.

Assigning macros to predefined icons modifies *Word for Windows*' toolbar, but you can't install your own graphics as icons, and you can easily create nonsense combinations of icons and functions, like

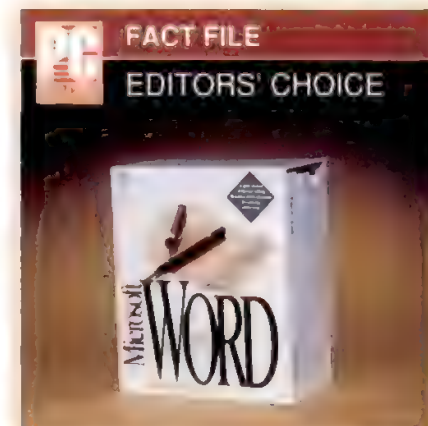
a clock icon that runs the grammar checker.

Word for Windows' file manager displays miniature images of *Word for Windows* files, complete with fonts and formatting, and after some delay, can convert and display other programs' files. You can delete, copy, or print directly from the File menu, or you can use their document summaries to search for files containing specified text, keywords, or other entries.

Linked files function much like *Ami Pro*'s master documents: On-screen you can view either a field that names the linked file or the file's contents, and any changes you make while working on the master document can be exported back to the linked file. This feature makes it easy to work with tables of contents or indexes, and *Word for Windows*' index entries can span multiple pages.

EMBEDDED APPLICATIONS

Word for Windows' frames expand when you add text. Tables can include math and are easily modified with the mouse. *Word for Windows* borrows its strong embedded charting application from *Excel*. The weaker drawing application, based on Microsoft's *PowerPoint*, can't manipulate text as *Ami Pro* can. *Word for Windows*' embedded equation application,

**Microsoft Word for Windows, Version 2.0**

Microsoft Corp., One Microsoft Way,
Redmond, WA 98052; 800-426-9400,
206-882 8080.

List Price: \$495.

Requires: 2MB RAM, DOS 3.1 or later,
Microsoft Windows 3.0.

In Short: *Microsoft Word for Windows*, Version 2.0, is fast and sleek. This superb program combines powerful text processing with support for OLE mini-applications that add graphics, charts, and equations. Its automatic envelope printing and effortless mail-merge are among the best features in any Windows word processor.

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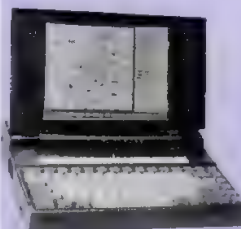
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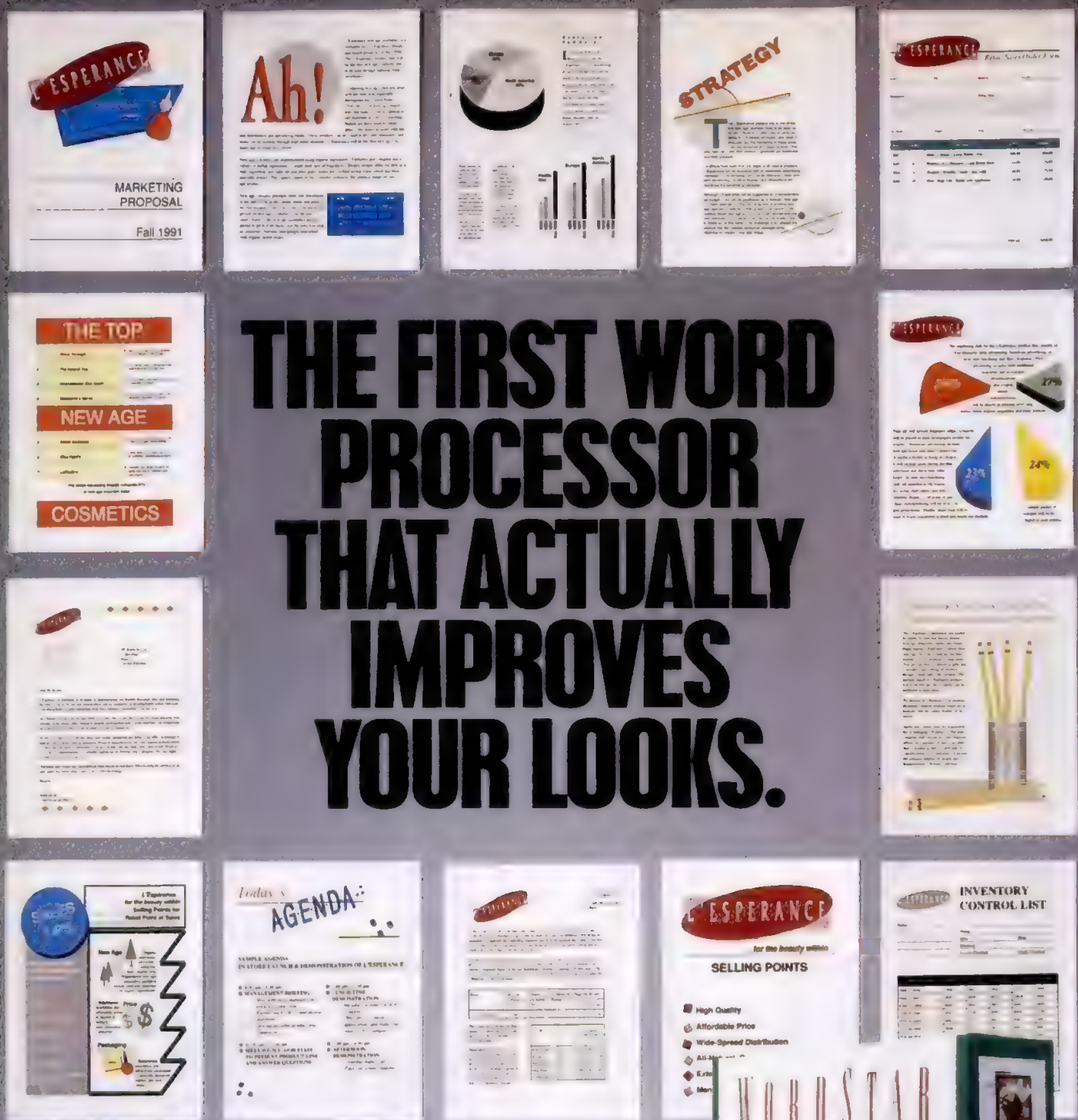
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COVER STORY

GUI WORD PROCESSORS



WINDOWS WORD PROCESSORS: SUMMARY OF FEATURES

Products listed in alphabetical order

—Editors' Choice
☒ —Yes ☐ —No

	Aml Pro	DeScribe Word Processor	JustWrite	Microsoft Word for Windows	Professional Write Plus	WordPerfect 5.1 for Windows	WordStar for Windows
List price	\$495	\$495	\$199	\$495	\$249	\$495	\$495
Network-ready	☒	☒	☒	☒	☒	☒	☒
Cost per additional user on network	\$395	\$350	\$199	\$395	\$185	\$349	\$150
MEMORY AND DISK USAGE							
Disk space used by default installation	11MB	7MB	4MB	15MB	4MB	8.5MB	10MB
Client/server DDE support	☒	☒	☒	☒	☒	☒	☒
Client/server OLE support	☒	☒	☒	☒	☒	☒	☒
TEXT-FORMATTING FEATURES							
Broken underline	☒	☒	☐	☒	☒	☒	☐
Double underline	☒	☒	☐	☒	☒	☒	☒
Strikethrough	☒	☒	☒	☒	☒	☒	☒
Small capitals	☒	☒	☐	☒	☒	☒	☒
Variable page length within document	☒	☒	☐	☒	☒	☒	☒
Automatic renumbering of pages after formatting	☒	☒	☒	☒	☒	☒	☒
Vertical centering	☒	☐	☐	☒	☐	☒	☐
Conditional page breaks	☒	☒	☐	☒	☒	☒	☒
Paragraph linking	☒	☒	☒	☒	☒	☒	☒
Sorting	☒	☒	☐	☒	☐	☒	☐
Line numbering	☒	☐	☒	☒	☐	☒	☐
Portrait and landscape pages within single document	☒	☐	☐	☒	☐	☒	☒
TEXT ENTRY AND EDITING FEATURES							
User can adjust margins on ruler	☒	☒	☒	☒	☐	☒	☒
User can adjust columns on ruler	☒	☒	☐	☒	☐	☒	☐
Paragraph marker display option	☒	☒	☒	☒	☒	☒	☒
Format code display option	☐	☒	☐	☐	☐	☒	☒
Maximum number of undelete levels	4	Unlimited	1	1	4	3	1
Widow and orphan control	☒	☒	☐	☒	☒	☒	☒
Zoom feature	☒	☒	☒	☒	☒	☒	☒
User-adjustable zoom levels	10–400%	10–500%	25–200%	25–200%	10–400%	Unlimited	25–200%
Appends block to file on-disk	☐	☒	☐	☒	☐	☒	☐
Search-and-replace:							
Searches forward and backward	☒	☒	☒	☒	☒	☒	☒
Searches within other files	☒	☐	☐	☐	☐	☒	☐
Performs case-sensitive searches	☒	☒	☒	☒	☒	☐	☒
Recognizes whole words	☒	☒	☐	☒	☒	☒	☐
Uses wildcards in search	☒	☒	☒	☒	☒	☒	☒
Uses wildcards in replace	☒	☒	☐	☒	☒	☐	☒
Searches and replaces format codes	☒	☒	☒	☒	☒	☒	☒
Maximum number of documents open simultaneously	9	Unlimited	8	9	Unlimited	9	1
Maximum number of text windows in one document without opening second copy of program	9	Unlimited	1	9	1	9	1
PRINTING FEATURES							
Prints in background	☒	☒	☐	☒	☐	☐	☐
Prints blocks	☒	☐	☐	☒	☐	☒	☐
Prints discontinuous range of pages	☒	☐	☐	☐	☐	☒	☒
Prints current page	☐	☐	☐	☒	☐	☒	☐
Prints landscape printer setup change	☒	☒	☒	☒	☐	☒	☐
Prints with crop marks	☒	☒	☐	☐	☒	☐	☒
Prints in reverse order	☒	☒	☒	☒	☒	☒	☒
Collates print job	☒	☒	☒	☒	☒	☒	☒
Controls printer bin for first page	☒	☒	☐	☒	☒	☒	☐
Supports non-Microsoft Windows character set	☒	☒	☐	☒	☒	☒	☐
Automatic envelope formatting and printing	☐	☒	☐	☒	☐	☐	☐

CONTINUES

COVER STORY

GUI WORD PROCESSORS

WINDOWS WORD PROCESSORS: SUMMARY OF FEATURES

Products listed in alphabetical order



	Ami Pro	DeScribe Word Processor	JustWrite	Microsoft Word for Windows	Professional Write Plus	WordPerfect 5.1 for Windows	WordStar for Windows
FILE-HANDLING FEATURES							
Maximum number of documents open simultaneously	9	Unlimited	8	9	1	9	1
Performs backup at user-selected time intervals	■	■	■	■	■	■	■
Includes file management functions	■	□	□	■	■	■	□
Searches disk for filenames	□	□	□	■	□	■	□
Searches disk for text within files	■	□	□	■	□	■	□
File import/export formats:							
Ami Pro	■/■	■/■	■/■	□/□	■/■	■/■	■/■
Microsoft Word	■/■	■/■	■/■	■/■	■/■	■/■	■/■
Microsoft Word for Windows	■/■	□/□	■/■	■/■	■/■	■/■	■/■
MultiMate	■/■	■/■	■/■	■/■	■/■	■/■	■/■
WordPerfect	■/■	■/■	■/■	■/■	■/■	■/■	■/■
WordStar	■/■	■/■	■/■	■/■	■/■	■/■	■/■
HYPHENATION AND GRAMMAR FEATURES							
Hyphenation	■	■	■	■	■	■	■
Customizable hyphenation dictionary	□	□	□	■	□	■	■
User can enter soft hyphens from keyboard	■	■	■	■	■	■	■
Hyphenation on a paragraph level	■	■	■	■	■	■	■
Limits number of consecutive hyphens at end of columns	■	■	□	■	□	□	■
Spell-checker:							
Number of words in standard dictionary	130,000	84,000	100,000	130,000	130,000	115,000	119,000
Spell-checks defined block	■	■	■	■	■	■	■
Spell-checks document with one command	■	■	■	■	■	■	■
Specialized spell-checkers:							
Legal	□	■	■	■	□	□	■
Medical	□	■	■	■	□	□	■
Foreign-language	■	■	■	■	■	■	■
Thesaurus	□	■	■	□	■	■	■
Antonyms provided	N/A	■	□	N/A	□	■	■
Grammar checker	□	□	□	■	■	□	■
Customizable rules	N/A	N/A	N/A	■	■	N/A	■
MANUSCRIPT PREPARATION FEATURES							
Generates table of contents	■	■	■	■	□	■	■
Generates index	■	■	■	■	□	■	■
Footnotes	■	■	■	■	■	■	■
Endnotes	■	■	■	■	■	■	■
Cross-referencing	■	■	□	■	□	■	■
Collapsible outlines	■	□	■	■	□	□	□
Allows user-defined numbering schemes	■	□	□	□	□	■	■
Allows military-style numbering	■	□	□	■	□	■	■
Bookmarks	■	■	■	■	□	□	■
DESKTOP PUBLISHING							
Includes stylesheets	■	■	■	■	■	■	■
User can modify default stylesheet	■	■	■	■	■	■	■
User can apply different styles to existing document	■	■	■	■	■	■	■
Maximum number of columns	8	20	8	32	8	24	32
Column snaking	■	■	■	■	■	■	■
Automatically balances text horizontally across multiple columns	■	■	■	■	■	■	■
Adjustable gutter width	■	■	■	■	■	■	■
User can define column width by moving cursor	■	□	□	□	□	■	□
User can draw lines with cursor	■	■	□	■	■	■	■
Expandable box around text	■	■	■	■	■	■	■
Irregular nonrectangular box around text	□	□	□	□	□	■	■

N/A—Not applicable: The product does not have this feature.

CONTINUES

**CAN AN 8,000 LB. ELEPHANT
OUTRUN THE GAZELLES?**



STAND

Introducing Desktop

At the risk of understatement, Desktop Direct from Digital is about to shake up the PC industry. Because we believe that a PC company should be low cost—but not lightweight.

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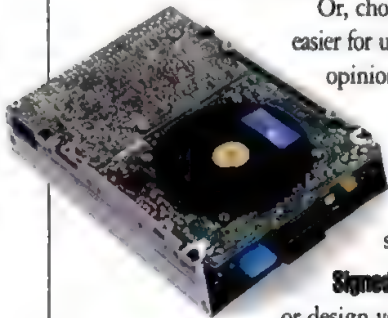
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Includes:
Microprocessor: Intel i386 running at 20MHz
Memory: 1MB, 80NS Memory Kit
Storage: 52MB IDE Hard Disk Drive
Resolution Mode: 1024 X 768 SVGA Adapter
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Keyboard: 101-key Keyboard
Mouse: Mouse
Operating Systems: MS-DOS 5.0 and MS-Windows 3.0
Special Package Price **\$1,899**
(DJ-PC443-03)

DECpc 333c



Includes:
Microprocessor: Intel i386 running at 33MHz
Memory: 4MB, 80NS Memory Kit
Storage: 52MB IDE Hard Disk Drive
Resolution Mode: 1024 X 768 SVGA Adapter
Display: 14" SVGA Color Monitor
Keyboard: 101-key Keyboard
Mouse: Mouse
Operating Systems: MS-DOS 5.0 and MS-Windows 3.0

Special Package Price **\$3,199**
(DJ-PC463-06)

DECpc 433 workstation



Includes:
Microprocessor: Intel i486 running at 33MHz
Memory: 8MB, 80NS Memory Kit
Storage: 40MB IDE Hard Disk Drive
Resolution Mode: 1280 X 1024 TIGA Adapter
Display: 20" Color SVGA Monitor
Keyboard: 101-key Keyboard
Mouse: Three-button Logitech mouse
Operating Systems: MS-DOS 5.0 and MS-Windows 3.0
Special Package Price **\$5,999**
(DJ-PC W10-BB)

THE PACKS.

DECpc 316sx



Includes:
Microprocessor: Intel i386 running at 16MHz
Memory: 1MB, 80NS Memory Kit
Storage: 52MB IDE Hard Disk Drive
Resolution Mode: 1024 X 768 SVGA Adapter
Display: 14" VGA Color Plus Monitor
Keyboard: 101-key Keyboard
Mouse: Two-button mouse
Operating Systems: MS-DOS 5.0 and MS-Windows 3.0

Special Package Price **\$1,799**

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DECpc 325c



Includes:
Microprocessor: Intel i386 running at 25MHz
Memory: 4MB, 80NS Memory Kit
Storage: 52MB IDE Hard Disk Drive
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Display: 14" VGA Color Plus Monitor
Keyboard: 101-key Keyboard
Mouse: Two-button Mouse
Operating Systems: MS-DOS 5.0 and MS-Windows 3.0

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DECpc 433 workstation



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Memory: 8MB, 80NS Memory Kit
Storage: 209MB SCSI Hard Disk Drive
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Display: 20" Color SVGA Monitor
Keyboard: 101-key Keyboard
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Your Name _____

Title _____

Company Name _____

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City _____

State _____

Zip _____

Office Telephone No. _____

Your FAX No. _____

If you have an idea of the PC specs you need, just jot them down in the blanks provided and we'll recommend a system that's right for you.

☐ Here are my specs. Now call me with my new system recommendation.

Customization Worksheet

Your base system is a: ☐ 286 ☐ 386 ☐ 486 ☐ Other

How many applications will your PC(s) run in a typical workday? _____

What best describes the type of work the system will be used for?
(Check all that apply):

- | | | |
|--|---|--|
| ☐ Word Processing | ☐ Desktop Publishing | ☐ Scientific Research |
| ☐ Order-entry | ☐ Education | ☐ Software Development |
| ☐ Database (filing records) | ☐ Design (CAD/CAM) | ☐ E-Mail |
| ☐ Financial Calculations | ☐ Engineering | ☐ Other industry-specific applications (please specify) |
| ☐ Retail Store Management | ☐ Industrial Process Control | |

How many people work in your group, department or small business?

- ☐ Less than 10 ☐ 10-20 ☐ 20-35 ☐ More

Is your operating system:

- ☐ DOS ☐ DOS with Windows ☐ OS/2 ☐ MAC ☐ UNIX™ ☐ Other

Questions:

Which of the following graphics-oriented applications best describes your needs?
(Check all that apply)

- | | | |
|---|--|--|
| ☐ Desktop Publishing | ☐ Realtime Modeling | ☐ AutoCad |
| ☐ CAD/CAM | ☐ Animation | ☐ Business Graphics |
| | ☐ Image Processing | |

LAN Manager

How many PCs do you have installed? _____ From how many manufacturers? _____

What kinds of connections does your PC(s) require? (Check all that apply)

- ☐ Links with other PCs in the immediate surroundings
☐ Connection to the local area network (LAN) throughout a building
☐ A line to a host system in a remote location

What kind of media (cable) is used in your LANs today? _____

What is the networking software now being used in your company? _____

What kind of host system will your PC communicate with?

- ☐ DEC ☐ IBM ☐ Other _____

What Kind of Service Do You Really Need?

- ☐ On-site Hardware Support ☐ Software Support ☐ Telephone Support
☐ Training ☐ FAX Hotline

How many of your users take portables on the road? _____

Do you currently have a service contract(s) for your PCs? ☐ How many? _____

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COVER STORY

GUI WORD PROCESSORS

WINDOWS WORD PROCESSORS: SUMMARY OF FEATURES

Products listed in alphabetical order

 —Editors' Choice
☒—Yes ☐—No



	 Ami Pro	DeScribe Word Processor	JustWrite	Microsoft Word for Windows	Professional Write Plus	WordPerfect 5.1 for Windows	WordStar for Windows
GRAPHICS IMPORT FORMATS							
.BMP	☒	☒	☒	☒	☒	☒	☒
.CGM	☒	☒	☒	☒	☒	☒	☒
.DRW	☒	☒	☒	☒	☒	☒	☒
.EPS	☒	☒	☒	☒	☒	☒	☒
HPGL	☒	☒	☒	☒	☒	☒	☒
.MSP	☒	☒	☒	☒	☒	☒	☒
.PCL	☒	☒	☒	☒	☒	☒	☒
.PCX	☒	☒	☒	☒	☒	☒	☒
.PIC	☒	☒	☒	☒	☒	☒	☒
.PIX	☒	☒	☒	☒	☒	☒	☒
TIFF	☒	☒	☒	☒	☒	☒	☒
.WMF	☒	☒	☒	☒	☒	☒	☒
.WPG	☒	☒	☒	☒	☒	☒	☒
Can resize imported graphics	☒	☒	☒	☒	☒	☒	☒
Text flows around graphics	☒	☒	☒	☒	☒	☒	☒
Clip art included	☒	☒	☒	☒	☒	☒	☒
Drawing tools	☒	☒	☒	☒	☒	☒	☒
Freehand tools (not just curves)	☒	☒	☒	☒	☒	☒	☒
Rotatable text	☒	☒	☒	☒	☒	☒	☒
Files can be directly imported by PageMaker	☒	☒	☒	☒	☒	☒	☒
Files can be directly imported by Ventura Publisher	☒	☒	☒	☒	☒	☒	☒
TABLE FEATURES							
Automatically adjusts table row height to accommodate text	☒	☒	☒	☒	☒	☒	☒
User can place different line styles around table cells	☒	☒	☒	☒	☒	☒	☒
User can shade cells	☒	☒	☒	☒	☒	☒	☒
User can control column widths directly on-screen	☒	☒	☒	☒	☒	☒	☒
User can control row heights directly on-screen	☒	☒	☒	☒	☒	☒	☒
User can put graphics in tables	☒	☒	☒	☒	☒	☒	☒
NUMERIC FEATURES							
Math mode	☒	☒	☒	☒	☒	☒	☒
Dynamic table functions	☒	☒	☒	☒	☒	☒	☒
Arithmetic operations within document	☒	☒	☒	☒	☒	☒	☒
CORPORATE AND PROFESSIONAL FEATURES							
Mail-merge	☒	☒	☒	☒	☒	☒	☒
Conditional merge	☒	☒	☒	☒	☒	☒	☒
User can select fields from menu	☒	☒	☒	☒	☒	☒	☒
Group editing	☒	☒	☒	☒	☒	☒	☒
Revision marking with user-specified attributes	☒	☒	☒	☒	☒	☒	☒
Revision marking in color	☒	☒	☒	☒	☒	☒	☒
Changes verified one by one	☒	☒	☒	☒	☒	☒	☒
File comparison	☒	☒	☒	☒	☒	☒	☒
Direct e-mail link	☒	☒	☒	☒	☒	☒	☒
Passwords to prevent file modifications	☒	☒	☒	☒	☒	☒	☒
File encryption	☒	☒	☒	☒	☒	☒	☒
Preformatted forms processing	☒	☒	☒	☒	☒	☒	☒
MACRO FEATURES							
Keyboard recording mode	☒	☒	☒	☒	☒	☒	☒
Programmable macros (with if-then)	☒	☒	☒	☒	☒	☒	☒
HELP							
Context-sensitive help	☒	☒	☒	☒	☒	☒	☒
Keyboard templates included	☒	☒	☒	☒	☒	☒	☒
On-line tutorial	☒	☒	☒	☒	☒	☒	☒

ENDS

It's Built To Last. The ActionLaser II will stand up to year after year of heavy action. Its two-year warranty is the longest of any printer in its class. On top of that, you can call our 800 number for free technical support.



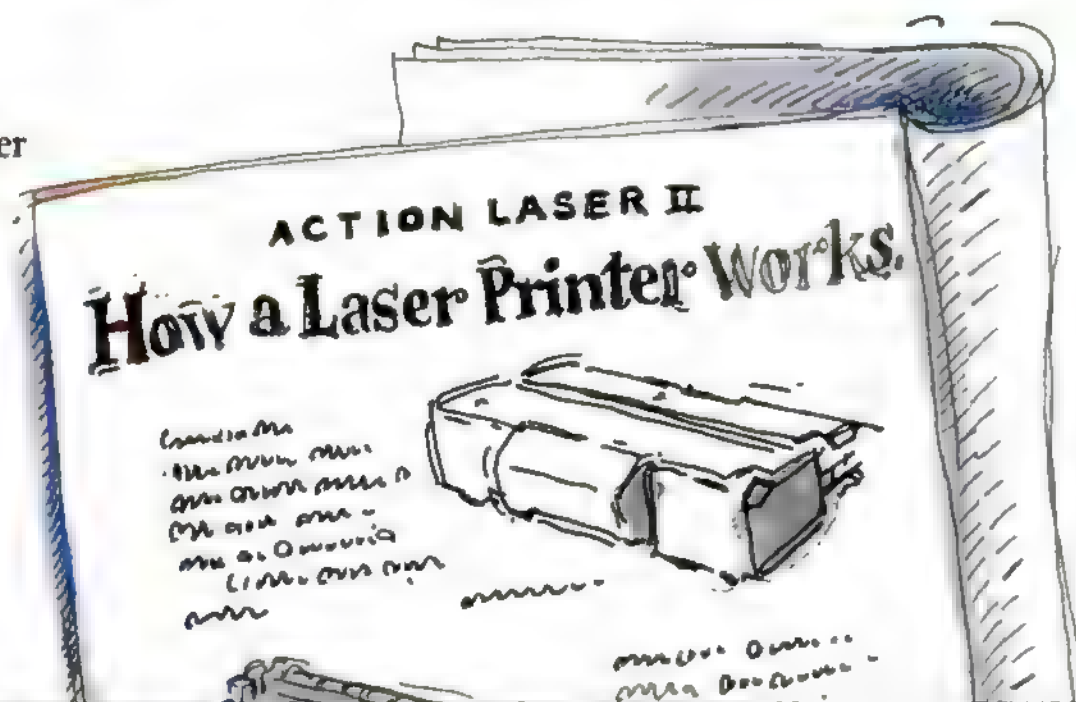
Introducing The Perfect Introduction To Laser Printing.

If you're ready for your first laser printer, but don't quite know where to begin, the new Epson® ActionLaser® II is a very comfortable place to start.

It offers all the practical features you'll need to stand out on paper. Like impeccable print quality. A control panel that makes operation a snap. And the security of a generous two-year warranty. All at a price that makes laser printing more affordable than ever.

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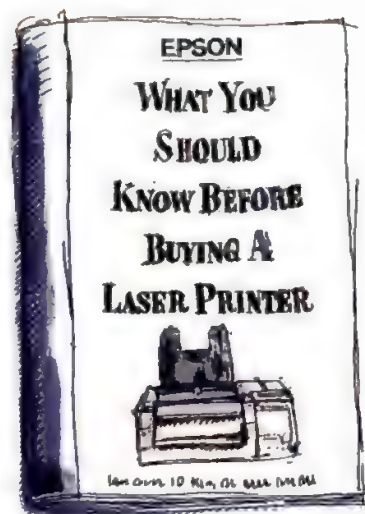
It's Easy To Use. Even if you've never used a laser printer before, you'll be up and printing in no time. The user manual—written especially for first time users—is clear, concise and helpful. And to make things even easier, this laser works with all leading computers and software.





It's Very Affordable. The ActionLaser II is a lot more laser for a lot less. More speed. More paper handling capabilities. More room to grow. More of the things you need to be productive—now and well into the future.

It's Our Free Booklet. Epson wrote the book on computer printing. Now we've written the book on buying your first laser. Read it and you'll be laser sharp in minutes. For a free copy, and the name of the Epson dealer nearest you, call 800-289-3776, ext. 1000.



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based on Design Science's *MathType*, is more graphical and intuitive than the equation editors in *Ami Pro* and *WordPerfect*.

MINOR LIMITATIONS

Some of the program's strongest features still suffer from minor weaknesses. *Word for Windows* only has single-level Undo, and you have to update the statistics in the Summary Information menu or write a macro to get a word count. The macro language, slightly improved over Version 1.x and supplemented with a dialog-box editor, is far surpassed by its stronger and simpler counterpart in *Ami Pro*. When customizing the display, you can make minor changes to drop-down menus, but you can't modify the top-line menu. You can map macros and commands only to Ctrl or Ctrl-Shift key combinations.

Word for Windows' on-the-fly redlining works perfectly, but its Compare Versions feature is so dangerous that you should probably remove it from the menu. When you compare a document on-screen with the on disk version, *Word for Windows* redlines every paragraph with even one small change; if you then select Undo Revisions, all the redlined paragraphs disappear. You can sometimes—but not always—bring them back with Undo, but only if you're lucky enough to notice their disappearance in time to do so.

However, *Word for Windows* does let you turn off an unsettling feature that afflicts most Windows programs: one that replaces selected text, even a complete file, with the next character you type.

CHOOSING ANEW

For users who plan to switch loyalties, *Word for Windows* includes a module that emulates *WordPerfect* keystrokes and explains equivalent keystrokes in *Word*

for Windows. The module is honest enough to say so when you use keystrokes that invoke features that are in *WordPerfect* but not in *Word for Windows*.

Word for Windows won't give you the graphics dazzle of *Ami Pro*, but more than any other Windows word processor, it offers the flexibility and keyboard conveniences you need for serious work with outlines and text. For automated ease of use, *Word for Windows*' envelope printing and menu-guided mail-merge are unequaled. For fast, effective editing and formatting, powerful stylesheets, and overall coherence of design, *Word for Windows* ranks among the strongest and most intelligent programs ever written.

Professional Write Plus

When you buy a copy of Software Publishing Corp.'s \$249 *Professional Write Plus*, Version 1.03, you don't get a Microsoft Windows port of the DOS-based *Professional Write*. Instead, you get a program that looks and acts like an enhanced and better-organized version of the original low-end *Ami* word-processor, the program that evolved separately into today's high-end *Ami Pro*.

Professional Write Plus (called *ProWrite Plus* in the program's title bar) offers much of *Ami Pro*'s ease of use, but with a less elegant interface, slower performance, and far fewer features. If you want to create files with outlines, tables, or tables of contents, you should probably look elsewhere. But if you like the *Ami*-style of word processing, you

SUITABILITY TO TASK Professional Write Plus

Letter/memo			
☐	☐	☐	☐
Business report			
☐	☐	☐	☐
Newsletter			
☐	☐	☐	☐
Long technical document			
☐	☐	☐	☐

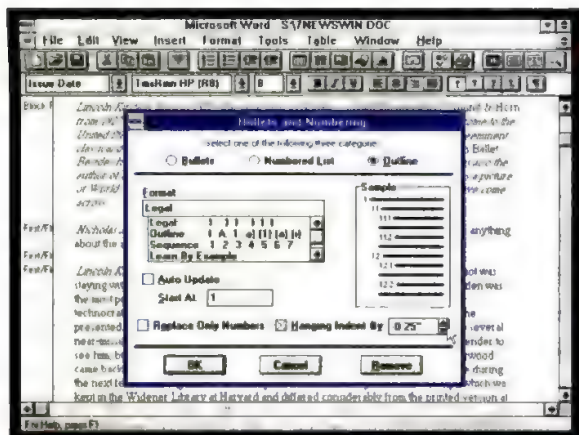
may want to consider *ProWrite Plus* as a low-cost alternative that makes smaller demands on disk space and offers a simpler interface. Unfortunately for Software Publishing, the new *Lotus Write 2.0*, a reduced but up-to-date version of *Ami Pro*, offers similar advantages at an even lower price.

ProWrite Plus has two display modes. One is a WYSIWYG page-layout mode (which optionally displays non-printing marks like paragraph breaks, tabs, and inserted tab rulers), and a draft mode that uses the Windows system font. Layout mode can be zoomed to four levels: a reduced full-page view, a customizable working view, and full-scale and double-scale views. You can also display a reduced, uneditable view of facing pages.

ITS OWN DOMAIN

Only *ProWrite Plus* offers direct access to MHS e-mail; you aren't restricted to *cc:Mail* as in *Ami Pro* or *Lotus Write*. *ProWrite Plus* lets you send the file on screen—optionally without graphics, or in ASCII format—and can display an icon when incoming mail arrives. You can attach any file on disk to outgoing messages. If incoming mail includes attachments created by other programs, *ProWrite Plus* tries to convert them. You can create an address book, but you can't automatically capture addresses from incoming mail.

Another feature you won't find in *Ami Pro* is *ProWrite Plus*'s grammar checking—although *ProWrite Plus* integrates this function so loosely into the word processor that you may do better with a more recent standalone grammar program. When you choose grammar from *ProWrite Plus*'s menu, it shuts down and



Microsoft Word for Windows displays thumbnail images of many formatting options. This menu lets you set outline formats; you can move easily from this menu to interactive displays of bullets and numbering.

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EXPECT TO PAY PEANUTS FOR IT.**



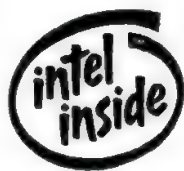
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And if that isn't impressive enough, the Dell 486P/20 comes with an upgradeable processor that can go from a 20 MHz i486SX chip all the way up to a high-end 33 MHz i486DX system, and even beyond.

Which, considering that we're talking about a computer under \$2,000, is nothing short of revolutionary.

A true power user's desktop. For its low price, the Dell 486P/20 has a lot of technical innovations you wouldn't expect to find on even higher end machines. Things like programmable Flash EPROMs, for example, that make conventional methods of upgrading system BIOS seem almost obsolete. You won't have to take this computer apart and lose your patience trying to pry out a reluctant chip. Just slip in a diskette — that's all.

Expanding memory is equally convenient. One of the few PCs to support 16 MB SIMMs, the 486P/20 carries 4 memory expansion sockets, on its main board. So as your needs grow, you can keep adding RAM in 1, 4, or 16 MB increments up to a total of 64 MB. That's plenty of room to run your networking software, Microsoft Windows and just about any high-performance graphics application.

And talking about graphics, a small expansion of video memory to 1 MB (512K is standard) will put over 32,000 colors at your disposal, letting you create images that approach photographic quality.

The 486P/20 also makes those images a lot easier on your eyes. It supports up

to 1024 x 768 non-interlaced video at a fast 70 Hz refresh rate for a flicker-free display. Unlike the kind you get on some competitive machines that are limited to 60 Hz non-interlaced.

An i486SX processor with the future built in. Because the Dell 486P/20 upgrades via a processor chip instead of traditional processor cards, upgrading takes the form of a single, economical step:

Just remove one chip and replace it with a higher performance version.

On the other hand, if you never need to upgrade at all, you don't end up having paid a price penalty to get the system in the first place. Either way, you win.

Apart from the processor, the 486P/20 is also designed to allow easy upgrading of hard disks, memory and video capability. So when your needs change, the rest of your computer can, too.



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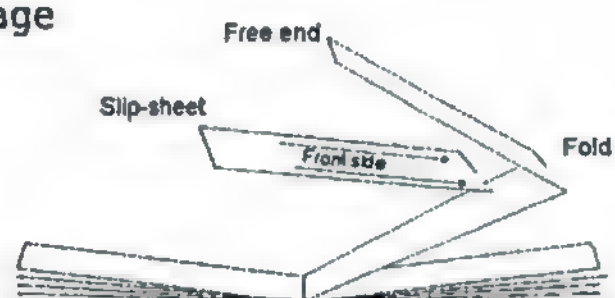


Mr. Pop

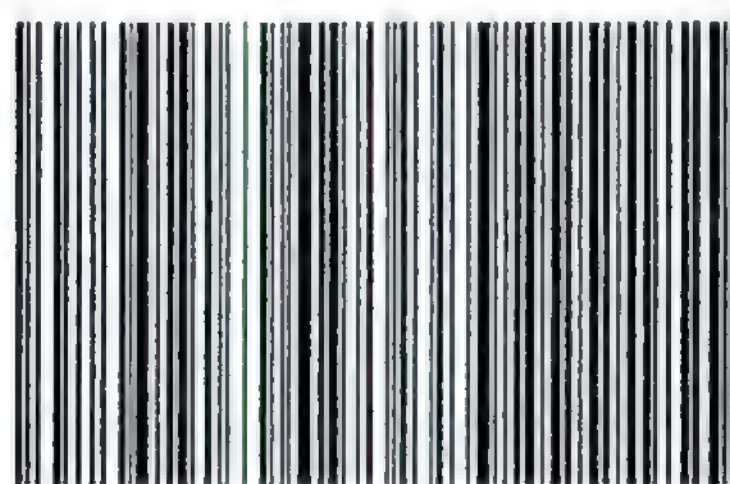


THE DELL 486P/20 20 MHz i486SX SYSTEM.*
SYSTEM INCLUDES 50 MB HARD DRIVE, VGA COLOR MONITOR, AND 2 MB RAM.

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



Inverted Foldout slip-sheet

Folded edge of the page

1. Open the foldout page

2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

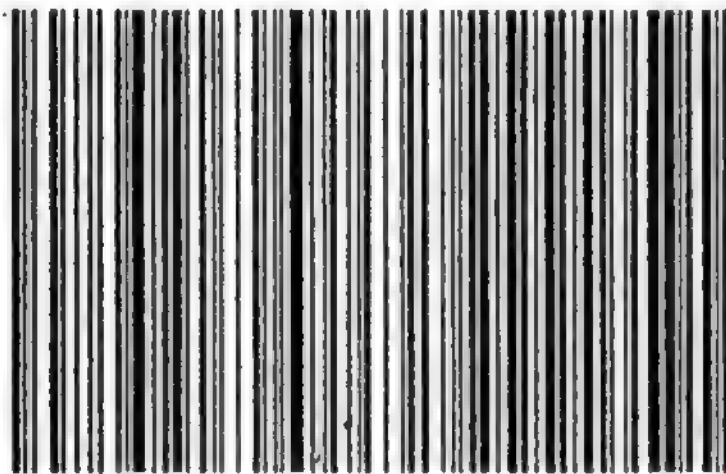
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-001B

Back

1. Follow instructions on the other side

THE MORE YOU GET, T

If your requirements call for a more powerful or specialized system than the one w
even better deal with our higher-end i486 systems. From \$248 all the way up to a whopping \$1,348, y
And if you still have any doubts, call us. We'll be happy to explain i

MORE VALUE

The Dell 486P/20 is a 20 MHz i486SX general purpose workstation you can upgrade to 33 MHz and beyond.

For a configuration that costs so little, you sure get a lot.

Like programmable Flash EPROMs for easy BIOS upgradeability.

And an 80 MB hard disk drive with 15 ms access time.

And an 8 KB cache built into the processor for increased throughput.

And 4 MB of RAM on 32-bit SIMMs with gold-plated connectors for greater reliability.

And 2 floppy drives.

Surprised? Keep reading.

You'll also get a 1024 x 768 14" color monitor with long persistence phosphors.

And the power to display 32,000 colors simultaneously, if you expand video memory to 1 MB.

And factory-installed MS-DOS® 5.0 and Microsoft Windows 3.0.

And a Microsoft Mouse.

And, considering it's from Dell, a whole lot of peace of mind.

That, by itself, is worth a fortune.



THE DELL 486P/20 20 MHz i486SX SYSTEM.*
SYSTEM INCLUDES 80 MB HARD DRIVE, SUPER VGA (1024 x 768) COLOR MONITOR,
5.25" 1.2 MB AND 3.5" 1.44 MB FLOPPY DRIVES AND 4 MB RAM.

SAVE \$248[▽]

MORE PRODUCTIVITY

The Dell 486D/25 is a sophisticated productivity workstation that was designed with your future in mind. To upgrade from a 25 MHz i486SX processor to a faster processor when available, all you'll need to do is replace a processor chip. Not a card. And starting with 4 MB, you can keep adding RAM up to a maximum of 64 MB.

This new system is priced on par with 33 MHz i386DX machines, yet performs up to 40% faster. And its sheer processing power is amply backed by a 100 MB hard drive with a 32 KB cache for increased throughput. A dual floppy drive completes the excellent storage arrangement.

A 1024 x 768 14" color monitor with a 70 Hz refresh rate gives you a flicker-free display. With 32,000 colors, if you make a small expansion of video RAM. Should anything go wrong, the built-in SmartVu™ diagnostic display can find the problem, even if the monitor goes down.

The 486D/25 comes with six expansion slots and five drive bays for added flexibility. You'll also get factory-loaded MS-DOS 5.0, Microsoft Windows 3.0 and a Microsoft Mouse.



THE DELL 486D/25 25 MHz i486SX SYSTEM.*
SYSTEM INCLUDES 100 MB HARD DRIVE, ULTRASCAN™ 14" MONITOR,
5.25" 1.2 MB AND 3.5" 1.44 MB FLOPPY DRIVES AND 4 MB RAM.

SAVE \$748[▽]

▽ Savings calculated from Dell retail pricing as of Dec. 9, 1991. No other discounts apply. Promotional prices expire 2/29/92. All prices and specifications are subject to change without notice. Dell and Dell System are registered trademarks. UltraScan is a registered trademark. and the Intel Inside Logo are trademarks of Intel Corporation. FORTUNE 500 is a registered trademark of the Time Inc. Magazine Company. OS/2 is a registered trademark licensed to Microsoft Corporation. MS-DOS and Microsoft are registered trademarks. and Windows were based on office sites with between 1 and 499 employees. Best Personal Computer in Office Based End User Satisfaction in Small to Medium Sized Businesses. J.D. Power and Associates is a registered service mark of J.D. Power and Associates, Ltd. (J.D. Power and Associates is not responsible for any errors or omissions in this advertisement.)

Gold-plated SIMMs increase system reliability by eliminating connection-related errors

There are plenty of companies anxious to sell i486 systems at a low price. All they really need is a supply of parts (the cheaper, the better) and a garage to assemble them in. Once the "production line" gets going, they place



The 486P20 is one of the few computers to feature 16 MB SIMMs.

a few ads in the paper. After that, of course, it's anyone's guess as to which will last longer: the computer or the "company" it came from.

At Dell, on the other hand, we offer lower prices by cutting down on traditional retailer mark-ups, not quality. In fact, we're almost fanatical about the quality of every machine that leaves our state-of-the-art factory. That attitude is reflected in the way we design, test, manufacture and ship our i486 systems.



Our Black Box test makes sure your Dell computer never arrives this way.

**To see
how our i486
systems stand up to air
delivery, we use a Black Box.**

Or, in technical parlance, a portable accelerometer/thermometer. This little device is fitted into a test computer which we then send out through regular delivery channels, much as if you had ordered it yourself. When we bring it back, the "Black Box" tells us exactly what the computer went through, in terms of shock, vibration and temperature. This innovative test is part of a series that's been so

successful in helping us improve our packaging, we've won an international award for package design.

To make our computers more reliable, we cook them. After our computers are fully assembled and configured, randomly selected units are "burned-in" and tested at 104°F.

In perhaps the most grueling temperature test we've ever come up with, pilot Dell systems must survive a storage chamber where temperatures vary rapidly between -40°C and +60°C.

JUST BECAUSE YOU PAY LESS DOESN'T MEAN YOU GET LESS.

Our computers have a heart of gold.

At Dell, we take quality consciousness so seriously, we fit our i486 systems with SIMMs that have gold-plated connectors. If you're wondering what such expensive components are doing in relatively inexpensive computers, the answer is simple: they cost us a bit more, but by eliminating connection-related errors, they're worth their weight in gold.

It's exactly this kind of commitment to quality control that's enabled us to meet CSA, UL, TUV-GS, FCC and VDE standards, earning worldwide regulatory approvals.

There are thousands of ways to use a Dell i486 system. Dell i486 systems are tested for compatibility with major

peripherals, software applications, network topologies and network operating systems, including Banyan and Novell, in several hundred permutations per system. They're

even tested for AS-400 connectivity. So you can use our machines in virtually any environment.

50% fewer opportunities for things to go wrong. After the traditional computer manufacturer builds a system,

it goes to the dealer, who then does his own configuring. That's 2 stages of manufacturing, which means twice as many opportunities for things to go wrong.

A Dell i486 system, on the other

hand, is manufactured only once. We custom-configure memory boards,

network cards and advanced video, testing the system as a unit.

We even load select software packages you buy from us, at no cost to you. That includes MS-DOS 5.0, Microsoft Windows 3.0, and many popular applications programs.

With 20 diskettes and 2 hours to load and configure just one system, imagine the time you'll save and the potential hassles you'll avoid. Which gives you yet another reason to buy a Dell i486 system:

When you open the box, you're ready to go.



800-545-9674

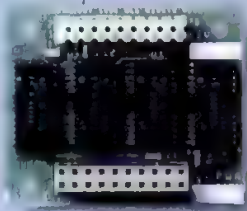
TO ORDER, CALL PLEASE REFERENCE #11855
HOURS: 7AM-9PM CT MON-FRI 8AM-4PM CT SAT 10AM-3PM CT SUN
IN CANADA 800-668-3021 IN MEXICO 95-800-010-0664

And if you think that's rough, consider our shock test. Sample i486 computers are strapped to a guillotine-like apparatus which repeatedly drops them to the

ground. This tells us what we can do to improve their shock tolerance level.

Our power supply units undergo an equally rigorous quality control process. In a test that simulates several years of actual usage, randomly selected test units are switched on and off 1,200 times; only then can they be approved.

While our testing may seem a little extreme, it's based on a rather simple fact: if our machines don't fail with us, they haven't much chance of failing with you, either.



A small expansion of video memory gives you over 32,000 colors for a near photographic quality display

WE THINK A COMPUTER SHOULD COME WITH MORE SUPPORT THAN THIS.

As a potential buyer, you'll receive lots of attention from most computer companies. Until they receive your check, that is. For all practical purposes, once the sale is closed, so is the company.

At Dell, on the other hand, half our story begins after you receive your computer. Despite our low prices, we've built a reputation for the highest level of support in the industry.

To begin with, a Dell expert works with you to figure out which computer, with which options, works best for you. We help you arrange financing from a wide variety of credit, lease and lease-to-buy plans. Then we test, pack and ship your

personalized personal computer to you via two-day air standard.

In the unlikely event that you have a problem with your computer, it won't last long. Our technical support staff solves 90% of reported problems over the phone. Usually in six minutes or less.

You can also get technical help 24 hours a day via our innovative TechFax™ line. Just dial up and detailed system information

will be automatically faxed back to you from the Dell Technical Library.

We even have a special section on CompuServe's PC vendor forum. So you can view other users'

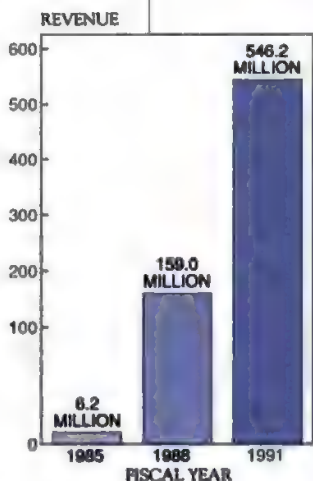
problems, and, more importantly, our solutions. But what makes our bulletin board special is that we constantly monitor what goes on there. Which means we can keep track of any small problems, and stop them before they become big ones.

But what if you have a problem that just can't be solved over the telephone?

On-site service is an ambiguous term.

To some enterprising vendors, it conveniently means that the replacement parts, and not the service technician, will arrive on-site. Which isn't as crazy as you may imagine; there are any number of do-it-yourself computer whiz kids in this business.

If you don't count yourself among their



Dell has built a \$546 million dollar business by building a relationship with every customer.

ranks, you'll prefer Dell's way of supporting our machines.

If needed, a trained technician can be at your home or office with a solution in hand, usually by the next business day.[△]

What's more, every time you call Dell Tech Support an entry is made in our customer database. So over time, we'll know your computer as well as you do. Maybe even better.

And you get all this support without getting

a bill. Because the price of your system includes on-site service coverage for a year, and phone support forever.

Buy a computer and get the company.

By standing firmly

behind every machine we've ever sold, we've built up a \$546 million company in just seven years, one customer at a time.

On the way, we've acquired quite a following. For example, the editors at PC Week have described the Dell service and support package as "overkill." J.D. Power and Associates[®] ranked Dell "Best PC in Customer Satisfaction in Small to Medium Sized Businesses."

We've won PC Week's Customer Satisfaction Poll an unprecedented eight times.

And in the last 12 months alone, we've collected 53 product awards, including PC Magazine's Editor's Choice, InfoWorld's Buyer's Insurance and PC World's Best Buy and World Class Awards.

And it's not just the smaller users that are satisfied, either: Dell computers are now used

by over two-thirds of the FORTUNE 500[®]. Overseas, it's been pretty much the

same story. We've more than doubled our overseas sales in the last 3 years in a row, and won in customer satisfaction surveys in the UK, Germany and France.

Still can't decide? Take 30 days to make up your mind. Within that time, if you aren't completely satisfied, just

return your Dell system and we'll refund your money, no questions asked.

We're proud to add, though, that this unconditional

guarantee has been used so sparingly, only 1.2% of the over half a million computers we've sold so far have ever come back.

What does keep coming back, in ever increasing numbers, are our customers. Over 70% of the people who buy a Dell computer buy another. That's perhaps the strongest statement of satisfaction any manufacturer could ever hope to receive.

So before you buy an i486 system, ask



Every Dell Computer comes with a trained computer staff who knows your computer as well as you do. Maybe better.



Our 53 product awards in 1991 alone make Dell one of the most awarded PC companies in the world.

around; there are plenty of Dell users out there. And if there's anything you need, call us. But you'd better hurry.

Great computers may last a long time but great deals don't.



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Last year, Dell won customer satisfaction polls in the U.S., U.K., Germany and France.

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PROCESSOR

- ☐ i486SX, 20 MHz
☐ i486SX, 25 MHz
☐ i486, 33 MHz
☐ i486, 50 MHz

ARCHITECTURE

- ☐ EISA
☐ ISA

CHASSIS

- ☐ Small Footprint
☐ Mid-Size
☐ Floor-Standing

DISKETTE DRIVES

- ☐ 3.5"
☐ 5.25"

MEMORY

- ☐ 4 MB
☐ 8 MB
☐ 16 MB

HARD DRIVES

- ☐ 50 MB
☐ 80 MB
☐ 100 MB
☐ 200 MB
☐ 320 MB
☐ 650 MB
☐ Other

MONITORS

- ☐ VGA Color, 14", 640 x 480,
 .39mm dot pitch
☐ VGA Color Plus, 14",
 640 x 480, .31mm dot pitch

- ☐ Super VGA Color, 14",

1024 x 768, 28mm dot pitch

- ☐ UltraScan 14C, 14", 1024 x 768, .28mm
 dot pitch non-interlaced, 70Hz

- ☐ UltraScan 15C, 15", 1024 x 768, .28mm
 dot pitch non-interlaced, 70Hz

- ☐ GPD-16C, 16", 1280 x 1024, .31mm dot pitch

- ☐ GPD-19C, 19", 1280 x 1024, .31mm dot pitch

OPERATING SYSTEMS

- ☐ MS-DOS 3.3
☐ MS-DOS 4.01
☐ MS-DOS 5.0
☐ MS-OS/2 1.21
☐ Dell UNIX® System V

OTHER (i.e.: tape drive, network card,
 mouse or modem)

Name _____

Title _____

Company _____

(If Applicable)

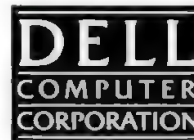
Address _____

City _____ State _____ Zip _____

Fax Number _____

Please have a Dell representative call me at

() _____



800-727-8320

COVER STORY

GUI WORD PROCESSORS

a custom version of *Grammatik for Windows* opens and checks your file.

ProWrite Plus's remaining features consist of a subset of the best of *Ami Pro*. Simply click on headers or footnotes to edit them; and stylesheets let you create numbered lists, lines below and above paragraphs, and use on-the-fly hyphenation—you can insert soft hyphens but can't edit the hyphenation dictionary. Use the mouse to draw frames, and fill them with multicolumned text or imported and rescaled graphics. Frames can automatically appear in the same place on all pages, or they can float between paragraphs.

Among *ProWrite Plus*'s editing and display features are a customizable icon bar with one-click access to major functions. You can specify four Undo levels. Files can include endnotes or footnotes, with a customizable separator line; footnote numbers can restart on every page.

SACRIFICES

In exchange for these features, you give up much that rival programs offer. The optional tab ruler doesn't let you change margin settings even though it displays them. You can edit only one file at a time; although, if you have enough RAM, you can open a second copy of the program and use the Windows Clipboard to exchange data between copies. The program doesn't open automatically with the last

file saved, or offer a list of recently used files on the file menu, as do *Ami Pro*, *WordPerfect*, and *Word for Windows*. The help screens use the obsolete *Ami* Help engine (now abandoned by *Ami Pro* itself) instead of the more flexible Windows Help engine.

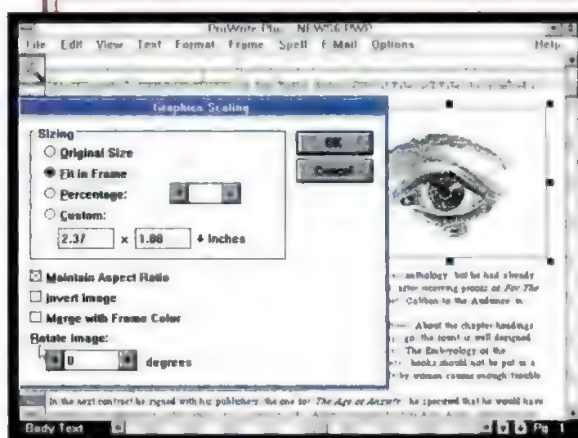
You can't create tables, although you can use DDE to import cells from an *Microsoft Excel* spreadsheet; *ProWrite Plus* uses tabs to format the imported data. The program doesn't offer graphics tools, but you can paste most standard formats and set up DDE links to Windows programs that create graphics.

Mail-merge is rudimentary at best, without programming or conditional-merge features. You can merge data from fixed-field and comma-delimited ASCII files, and from *ProWrite* documents. If use you ASCII files, you need to create a separate description file containing field names, and the menus won't give you any help creating them. Data files from the DOS version of *Professional Write* can't be used unless you export them from the DOS version in ASCII format.

ProWrite Plus loaded itself and its files quickly in PC Magazine Labs' Text Document Load test, but ranked between the middle and the bottom in most other tests. It makes moderately heavy use of system resources.

If *Professional Write Plus* appeared three years ago, it would have looked much stronger than it does now. It works easily and well, and its *Ami*-style interface remains flexible and intuitive, but you can find virtually all the same features (but not the MHS connection or the grammar checking) for less in *Lotus Write*, and vastly more features and conveniences, and a similar interface, in *Ami Pro*.

Professional Write Plus doesn't let you edit or create graphics, but it does give you a clear menu of scaling options that you can use when you import photographs.



WordPerfect 5.1 for Windows

The long-awaited *WordPerfect 5.1 for Windows* lets you work with exactly the same file formats, editing procedures, and advanced printer drivers that you use in *WordPerfect* for DOS. WordPerfect Corp.'s \$495 Microsoft Windows package is the only program that can generate exactly the same printed page from the slow-paced realism of Windows as it can from the corresponding program in the speedy character-based world of DOS.

WordPerfect's Windows version includes virtually the full feature set of the DOS version, but with graphics that you can move and resize with a mouse, and GUI conveniences like an easily customized icon bar, a ruler and interactive kerning.

It improves on the DOS version not only with its drop-down menu structure, but also with DDE support (in addition to



Professional Write Plus, Version 1.03
Software Publishing Corp., 3165 Kifer Rd.,
Santa Clara, CA 95051, 408-986-8000.
List Price: \$249

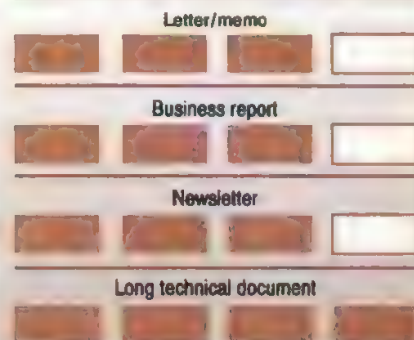
Requires: 1MB RAM (2MB with grammar checker), DOS 3.1 or later, Microsoft Windows 3.0.

In Short: *Professional Write Plus*, Version 1.03, performs like an enhanced version of *Ami*, the original package from which it evolved. It doesn't do outlines, tables, or tables of contents but if you like *Ami*'s style you may want to consider *ProWrite Plus*.

CIRCLE 471 ON READER SERVICE CARD

SUITABILITY TO TASK

WordPerfect 5.1 for Windows





PERFORMANCE TESTS: WINDOWS WORD PROCESSORS

A top-notch Windows word processor should deliver all of the advantages of the graphical environment without sacrificing the speed you need. Among the seven products we tested, *Ami Pro* and *Microsoft Word for Windows* stand out.

HOW WE TESTED

We tested the Windows word processors on a Compaq Deskpro 386/25 with 9MB RAM and a 300MB hard disk, running DOS 5.0 and Microsoft Windows. The system was connected to an HP LaserJet III printer.

In order to test the programs for speed, we used two documents: a 100K text file and a three-page compound document consisting of a .PCX graphics image, a TIFF image, text, and a table copied from *Microsoft Excel*. We ran each test three times, clocked the tests with a stopwatch, averaged the results, and rounded each score to the nearest second.

WHAT THE NUMBERS MEAN

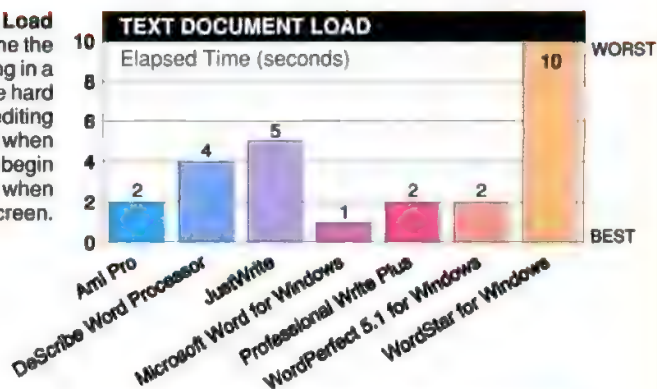
PC Magazine Labs' performance test results show that there are clear winners and losers among the Windows word processors.

Microsoft Word for Windows accomplishes just about every important function quickly—except printing. Printing is still a problem for Windows, and it's not surprising that the two programs that provide their own printer drivers, *Ami Pro* and *WordPerfect 5.1 for Windows*, outperform most of the others when their proprietary drivers are used.

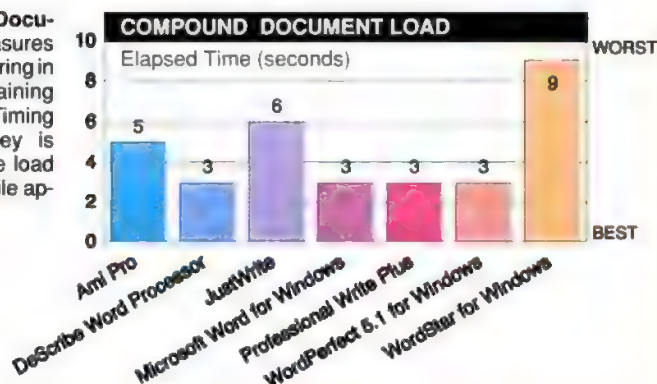
If you plan on including graphics in many of your documents, take special note of *Microsoft Word for Windows*' fast time on the Compound Document Top-to-Bottom Scroll test. Graphics scrolling is no longer the painfully slow process it once was (except in the case of *DeScribe Word Processor*).

The long-awaited *WordPerfect for Windows* was a middle-of-the-road performer on most of our tests. The notable exception was the Global Search-and-Replace test, where it did poorly.

The **Text Document Load** test measures the time the program takes to bring in a 100K text file from the hard disk and load it into editing mode. Timing starts when the key is pressed to begin the load and ends when the file appears on-screen.



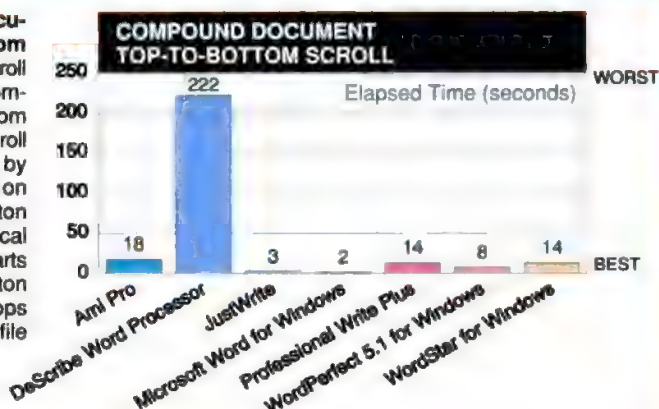
The **Compound Document Load** test measures the time required to bring in a document containing graphics and text. Timing starts when the key is pressed to begin the load and ends when the file appears on-screen.



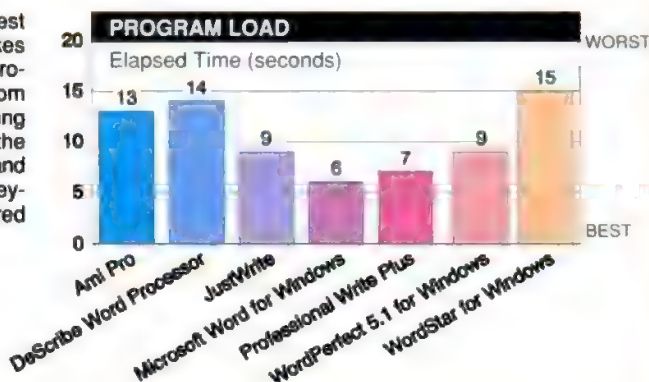
The **Global Search-and-Replace** test performs an automatic search-and-replace to locate 100 occurrences of a word in the text document and replaces each occurrence with another word. Timing begins with the command to execute the search execution and ends with the last word replacement.



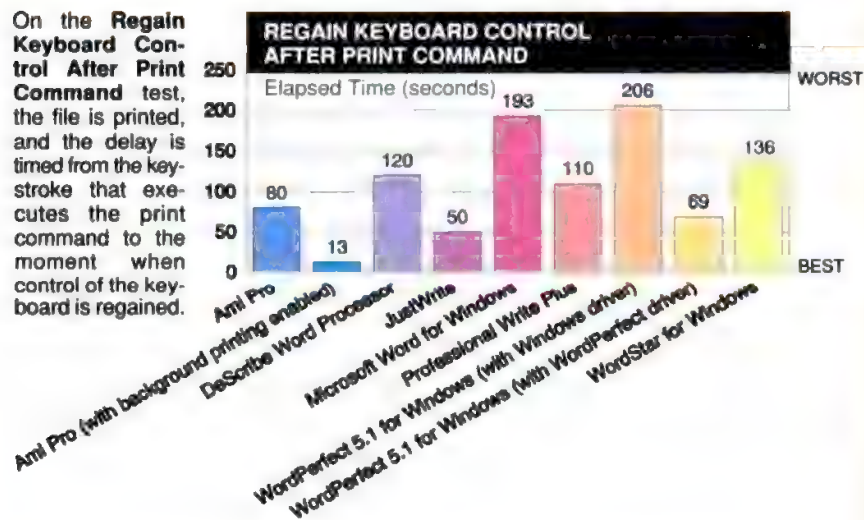
The **Compound Document Scroll** test times a scroll through the entire compound document from top to bottom. The scroll command is issued by placing the cursor on the Scroll Down button located on the Vertical Scroll bar. Timing starts when the mouse button is pushed and stops when the end of the file is reached.



The **Program Load** test times how long it takes to load the word processing program from the hard disk. Timing starts at the moment the Enter key is pressed and ends when new keystrokes can be entered into the program.



On the **Regain Keyboard Control After Print Command** test, the file is printed, and the delay is timed from the keystroke that executes the print command to the moment when control of the keyboard is regained.



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"...is little short of sensational."
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The New York Times

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CAMPBELL SERVICES INC.
MICRO SOFTWARE

**WordPerfect 5.1 for Windows**

WordPerfect Corp., 1555 N. Technology Way,
Orem, UT 84057; 800-451-5151, 801-225-
5000

List Price: \$495

Requires: 2MB RAM (4MB recommended),
DOS 3.1 or later, Microsoft Windows 3.0

In Short: *WordPerfect 5.1 for Windows* attempts the impossible with full *WordPerfect* for DOS compatibility and smooth functioning in Windows, it almost succeeds. Formatting is more difficult than in some higher-end packages, and it lacks features like collapsible outlining. But *WordPerfect for Windows* can use the same printer drivers and files as *WordPerfect* for DOS, which makes it a decent choice for users who upgrade to Windows.

CIRCLE 472 ON READER SERVICE CARD

the DOS version's warm links to spreadsheets), and nine (instead of two) file windows under Windows' Multiple Document Interface.

WordPerfect now has the best-implemented file-management of any word processor written for Windows or DOS. Its help screens are easier to navigate than those of any rival program, and *WordPerfect's* celebrated support is a toll-free call away. The only major features left behind are math in document text (math is still supported in tables) and a Repeat key that lets you specify the number of times to perform an action.

GUI JITTERS

WordPerfect Corp. designed its Windows version to allow an effortless transition from DOS. The result is a program with enormous power over formatting and printing, but one that doesn't seem entirely at home in a GUI environment. It has fewer WYSIWYG features than *Ami Pro* or *Word for Windows* and lacks the collapsible outlining and flexible style-sheet-based formatting of these major rivals.

WordPerfect's uneditable print preview is the only way to zoom the display or view a full page with headers and footnotes. The preview screen uses only

built-in generic screen fonts—even if you use ATM or have other screen fonts that match your printer fonts. The normal editing mode, which displays graphics and lets you manipulate them with the mouse, displays WYSIWYG text if you have the right screen fonts, but doesn't display headers or footnotes. A separate window takes over the screen when you edit headers, footnotes, or captions for graphics.

Two other views use Windows' monospaced system font to mimic *WordPerfect* for DOS: you can devote part of the normal editing window to a reveal-codes screen, which you'll need to use when revising formatting, or you can switch to a draft view that resembles the DOS version's editing screen, complete with long lines that scroll off the right edge.

A graphics editor lets you change shaded images to outline or black and white, but you'll need a graphics package to create or redraw images. As in the DOS version, you can insert graphics into text like any ordinary character.

TOTALLY MENU DRIVEN

Unlike rival packages, *WordPerfect* lets you choose even its most advanced and arcane features from a menu. When you insert a cross-reference, a dialog box tells you how to position the target of the reference. *Ami Pro* and *Word for Windows* sometimes make you type in file-names from memory, but *WordPerfect* always presents a directory list. These directory lists include Quick Lists—a brilliant innovation that lets you give a descriptive name like "Letters" or "Research Notes" to any directory or file specification. When you click on one of these names, the menu displays all the

files that correspond to it.

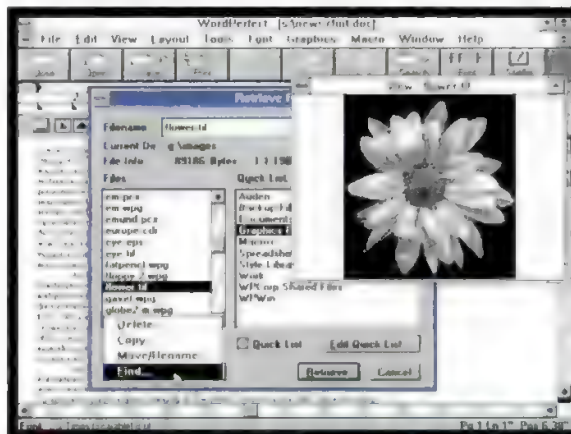
WordPerfect for Windows uses the same inserted codes as the DOS version. When sharing files between the different versions the DDE codes unique to Windows are ignored in DOS, and the math codes of the DOS version are ignored in Windows, but all files print identically. An option in the Windows version places codes intelligently—page format codes go to the top of the page, line-spacing codes go to the start of a paragraph—and removes any old code superceded by the new code.

As in other Windows programs, you can select any text and change its font, but you can't select an arbitrary group of paragraphs and change their margins or spacing with one command. To indent the first line of a paragraph, or create a hanging indent, you have to insert codes in front of every paragraph. *WordPerfect* supports styles that can include text, headers, and other features, but these styles merely insert codes and optional text—they don't paint text as in other programs.

WordPerfect for Windows includes the smart three-level Undo of the DOS version plus a single-level Undo like that of other Windows programs. Undo is safer than other programs' Undo because its buffer doesn't clear when you save a file. An extend-selection key works like the block key in DOS *WordPerfect* (and *Word for Windows*): You can extend the selection using any command, and the selection also stretches to the next character you type.

Instead of the picture-only icon bars in other programs, *WordPerfect's* customizable Button Bar that displays pictures, text, or both. You can assign any menu item, command, or macro to the Button Bar, and create buttons that call up other

Button Bars. *WordPerfect's*



Every *WordPerfect 5.1 for Windows* menu that lets you call up a file includes options for viewing, finding, copying, moving, or deleting files. You can use the Quick List feature to access directories or file specifications like C:\ACCOUNTS\1992\1ST_QTR*.WK? by a descriptive name like First Quarter Spreadsheets.

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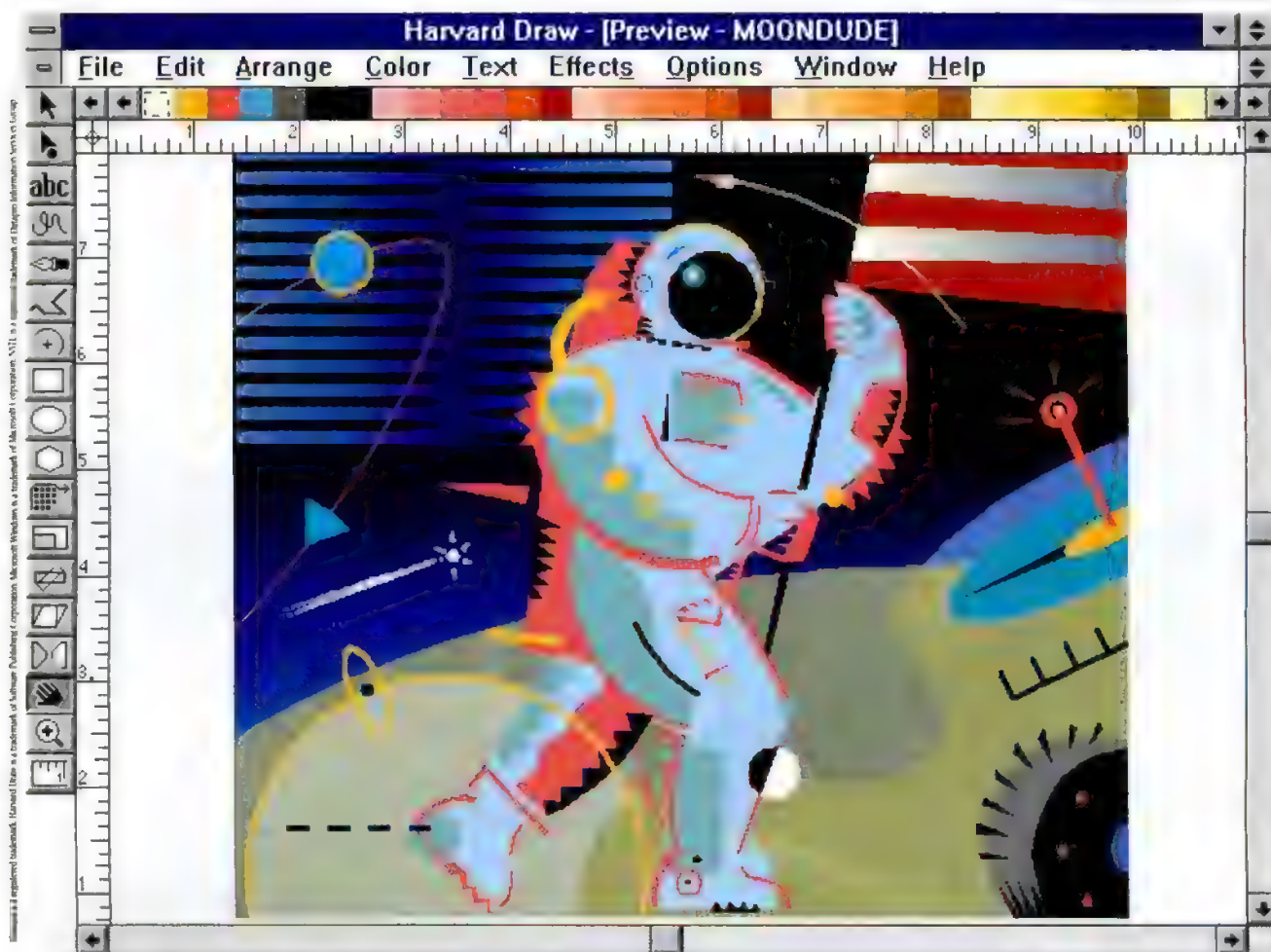
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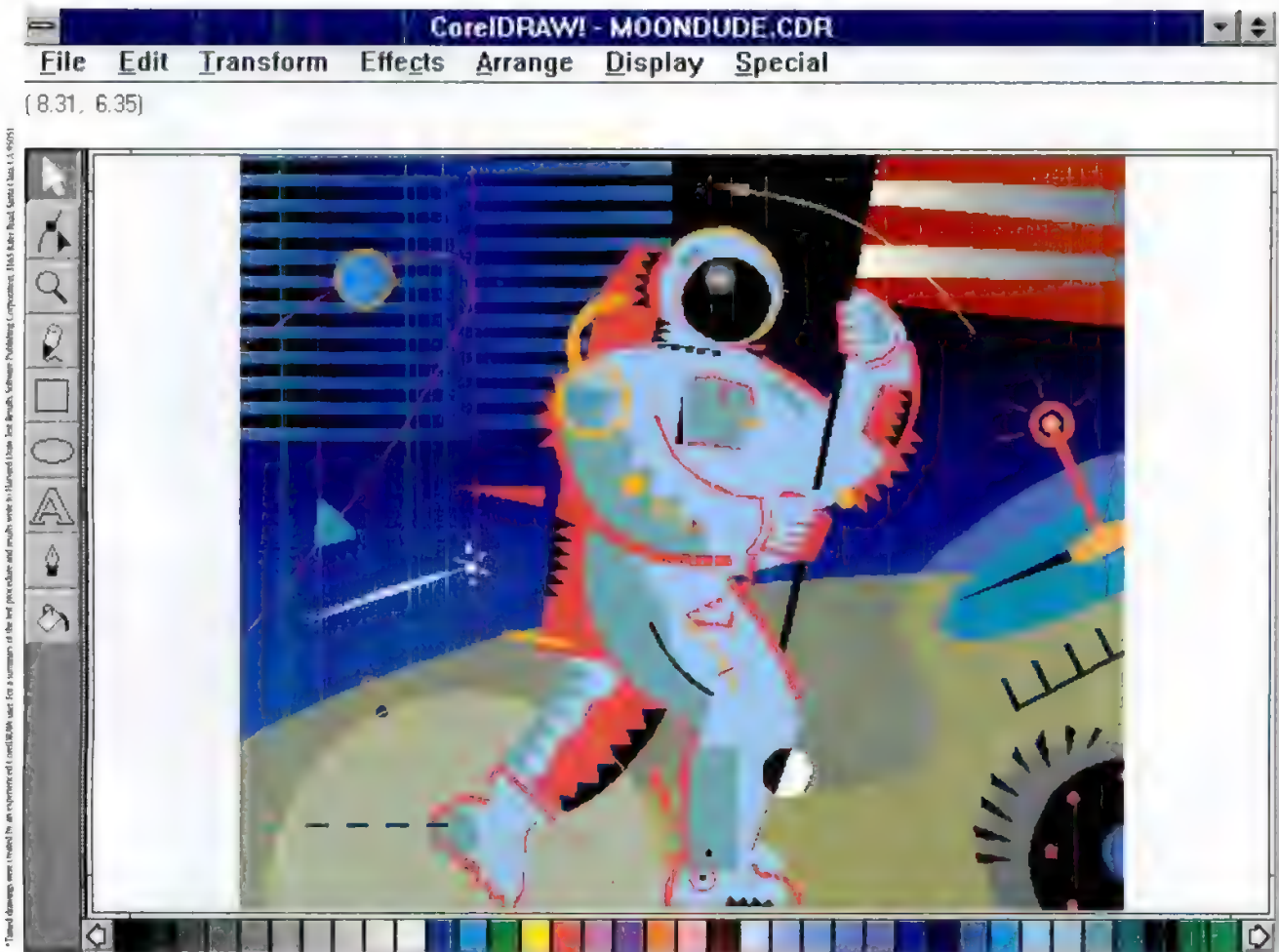
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your own conclusion.

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dows demo disk and a NSTL benchmark summary.

UP AND COMING IN WINDOWS WORD PROCESSING

by Edward Mendelson

If the seven Microsoft Windows word processors reviewed here don't offer what you want, take heart: At least three new word processors should hit the market this spring. NBI plans to ship a new version of *Legacy*, Computer Associates is readying *CA-Textor*, and Digital Equipment Corp. (DEC) plans to ship a Windows version of its long-established *DECwrite*.

NBI's \$495 *Legacy*, Version 2.0, which *PC Magazine* saw at its pre-release stage, occupies a niche between full-featured programs like *Ami Pro* and *Microsoft Word for Windows* and low-end programs such as *Professional Write Plus* and *JustWrite*. *Legacy*'s strength has always been its formatting precision, and Version 2.0 adds programmable macros, well-integrated grammar checking, and improved table and graphics editing. You still can't have more than one file open at the same time, and *Legacy*'s draft mode, while more attractive than previous versions, still doesn't encourage you to switch from its WYSIWYG mode.

You already know something about *Legacy* if you've seen *WordStar for Windows*, which is a heavily rewritten version of *Legacy*, Version 1.1. Like *WordStar for Windows*, *Legacy* is frame-oriented and operates in either a draft mode where you enter text, tabular data, or graphics, or in a frame mode where you manipulate the size and location of frames. As in desktop publishing packages, you can have linked frames with text that flows freely from a frame on one page to a frame on a distant page. You can position frames to a precision of 1/1,000 of an em dash, and can make a customized initial drop capital an element of paragraph style.

Legacy's menus, even in Version 2.0, aren't as clear as those in *WordStar for Windows*, and *Legacy* doesn't offer built-in emulation of *WordStar* keystrokes. But *Legacy* now offers a rich set of new features and better im-

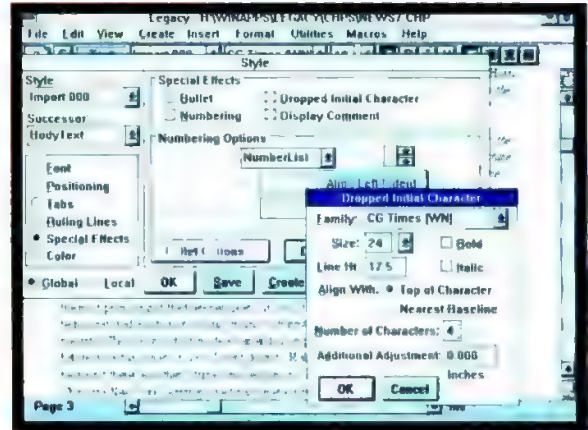
plementation of essential word-processing functions. Unlike *WordStar for Windows*, for example, *Legacy*'s search-and-replace feature and spell-check menus are smart enough to move out of the way of the text they highlight. Macros that come with the program can give you a word count from a menu, collapse an outline, and merge indexes. The macro language, while not as strong as *Ami Pro*'s, includes global variables.

You won't find a freehand tool among *Legacy*'s graphics tools, but you can create lines, arcs, and rotated text in any font. Effective import filters let you work with 256-color images, and the most-powerful image processing of any word processor lets you convert color images to gray scale or to black and white. You can maintain or modify scaling, adjust contrast, brightness, and sharpness, and you can select

NBI's *Legacy* 2.0 is the first program in the next wave of Windows word processors. Expect several more in 1992.

among three dithering techniques for the best possible printing.

Computer Associates introduced the \$225 *CA-Textor* at Fall Comdex last October, but it shipped too late for evaluation here. This package, which hails originally from France, will include many of the features associated with more expensive Windows word



***Legacy*'s crowded format menus let you set almost every imaginable typographic detail—and generally use typographic measurements. This screen is for customizing automatic dropped capitals at the start of a paragraph.**

processors, including table editing with dynamic calculation in the cells, automatic hyphenation, three editing modes, and English/French spell-checkers and dictionaries. Contact Computer Associates at 800-645-3003.

DEC didn't have a copy of *DECwrite*, Version 2.0 available in time for this evaluation, but the \$695 package is scheduled to include all standard word processing features, a drawing module, and 800 clip-art images. Keyboard emulations for *WordPerfect* and *Microsoft Word* are built in. Contact DEC at 603-884-2060.

The fate of another Windows word processor was in doubt as this issue went to press. Last October, Wang Laboratories announced its \$495 *UpWord*, Version 2.0, with special features for document management on a network. But its shipment was postponed shortly before the scheduled release date. And IBM Corp., which had planned to develop a Windows word processor using XyQuest's *XyWrite* as the underlying engine, shelved those plans last October. ■

***Legacy*, Version 2.0**

NBI Inc., 3375 Mitchell Lane, Boulder, CO 80301; 800-624-1111, 303-444-5710.

List Price: \$495.

Requirements: 2MB RAM, 20MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.0.

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GUI WORD PROCESSORS

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SWITCHABLE KEYBOARDS, DRIVERS

WordPerfect's default keyboard conforms to normal Windows standards, but you can toggle to a keyboard that corresponds closely to the DOS *WordPerfect* layout where Alt-F4 means Block, not Exit. Submenus always work as in the default Windows keyboard. You can define multiple keyboard layouts, and record macros that switch between them.

You can switch at any time from the printer drivers used by DOS *WordPerfect* to Windows' native drivers. The *WordPerfect* drivers print quickly and produce results identical to those you get from the DOS version; but they use ATM fonts only for the screen, and only if an ATM font happens to match a printer font specified in the driver. Both drivers let you access the full 1,500-plus characters in the *WordPerfect* character set, and any symbol not available in the driver's fonts

WordPerfect can hyphenate on the fly, and you can edit hyphenation points and spellings, too.

automatically prints as a graphic. You're better off with the *WordPerfect* drivers unless you want to print in color on non-PostScript printers. If you see the *WordPerfect* drivers, more characters print from fonts (instead of as coarser graphics), and you can print portrait and landscape pages in the same file. ATM symbol and dingbat fonts won't translate from Windows to *WordPerfect* drivers.

You can easily create indexes, tables of contents, and multiple lists of graphics, but you get limited options for indexes, and you can't automatically create entries that span more than one page.

LEAVE YOUR MACROS BEHIND

WordPerfect's new macro language prohibits you from using macros created in the DOS version. You now have to program many kinds of macros that could be

recorded under DOS. A supplied utility converts only the simplest macros from the DOS version. The new language makes it easy to write complex macros (although functions like dialog boxes remain difficult), but it can't approach the flexible, advanced macro languages of *Ami Pro* and *Word for Windows*. A macro manual costs \$19.95.

WordPerfect for Windows can hyphenate on the fly, and you can edit hyphenation points and spellings in the main dictionary. No other program includes this luxury—and no other program gives you a word count from a top-level menu. Unfortunately, the spell-checker defaults to Replace, which makes it easy for unwanted words to slip into your file.

You can use a menu to enter codes for programmable merges, but you have to enter field names by hand. You can't use *dBASE* files or spreadsheets for merge data without converting them to ASCII format. The document comparison feature marks whole phrases, not just changed words, and you can't redline on the fly.

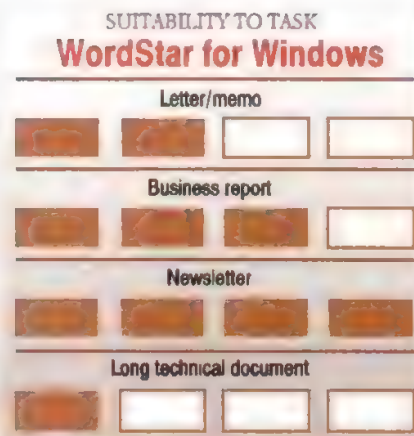
WordPerfect ranked among the slower packages on PC Magazine Labs' speed tests. With a Windows printer driver active, it printed sluggishly, but its own printer drivers brought it up to the speed of *Ami Pro* with its background printing turned off. It makes relatively heavy use of system resources and doesn't always release them when you close it.

If you now use *WordPerfect* for DOS and want to supplement or replace it with a Windows program, you won't go wrong with *WordPerfect for Windows*. Its limitations and strengths match the DOS version's, and a second version of the program likely to be released later this year will help you feel more at home in Windows. Despite its lack of outlining and true styles, *WordPerfect for Windows* has one of the richest and best-integrated feature sets of any program on the market.

WordStar for Windows

If you want a Microsoft Windows word processor with formidable control over page layout, typography, and graphics, you should look at *WordStar* Interna-

tional's \$495 *WordStar for Windows*, Version 1.0. If you want a Windows word processor that shares the command structure and file format of *WordStar* for DOS, keep looking.



WordStar for Windows is not a port of DOS *WordStar*, but a sleeker and better-looking version of NBI's *Legacy*, Version 1.1, which *WordStar* International formerly sold under the name *WordStar Legacy*. It lets you edit in WYSIWYG or draft views, open only one file at a time (DOS *WordStar* allows two), has a richer set of tools for formatting and graphics than it does for manipulating text, and uses frames and styles—instead of dot commands—to format a page.

The package uses two different modes for editing and formatting, although the manual is almost silent on this crucial fact. In the edit mode, you can enter text, format paragraphs, insert data in tables, or draw graphics. Switching to the frame mode lets you create the frames in which you create graphics and tables, select frames in order to move or resize them, and to apply frame styles that can control the general layout of one or more frames.

The two modes are especially confusing as a result of the near-silence about them in the manual and menus. They refer instead to a Frame tool and Edit tool, one of which is always active. The program automatically switches to the Frame tool when you use the Layout menu to change margins, but the manual doesn't warn you that you have to switch to the Frame tool by hand to access menu items that, for no obvious reason, are grayed out when you edit text. *Ami Pro*, in contrast, lets you select a frame simply by clicking on it once and lets you edit its contents by double-clicking.

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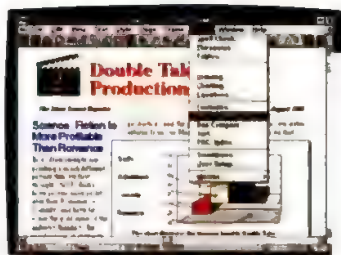
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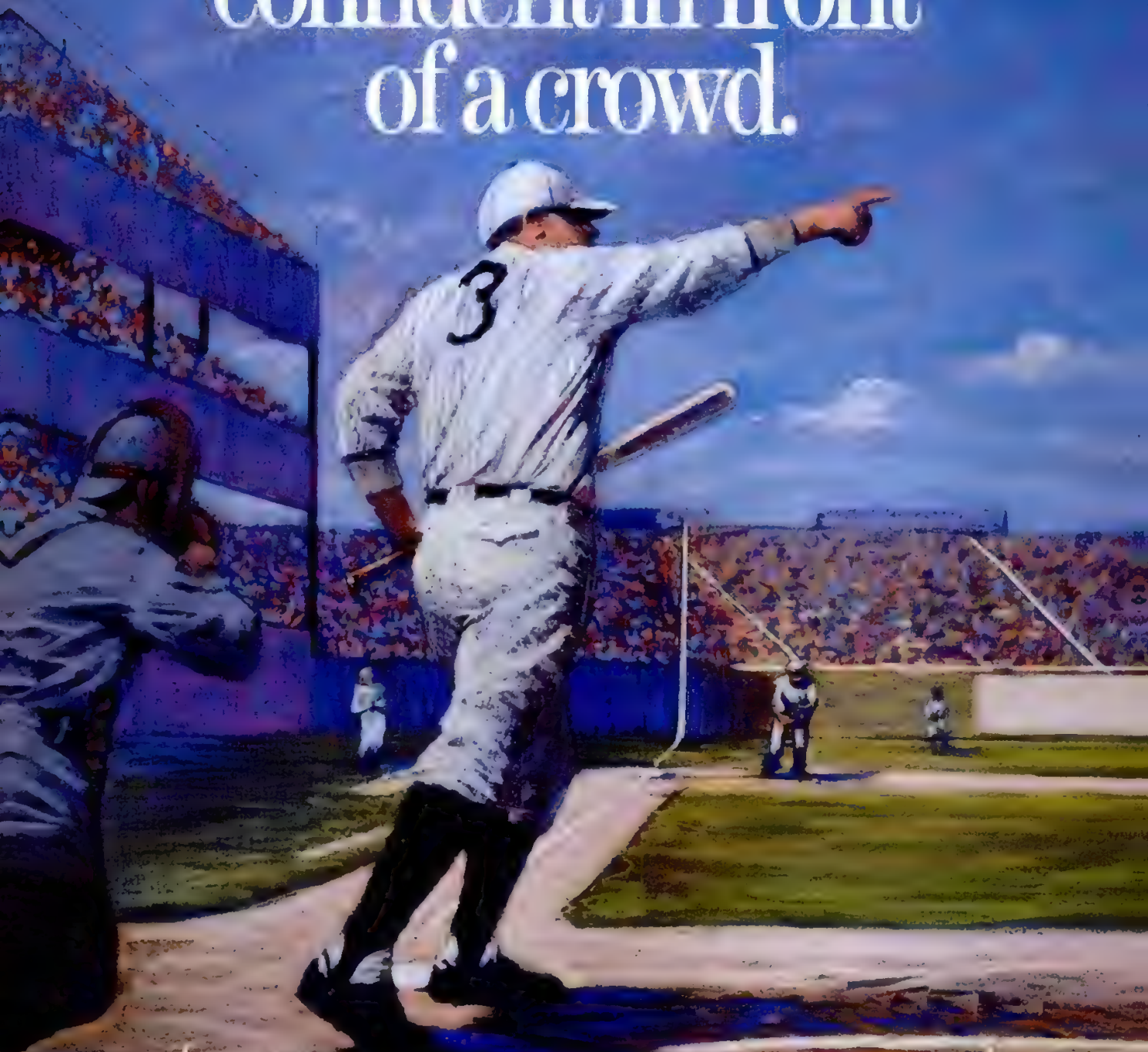
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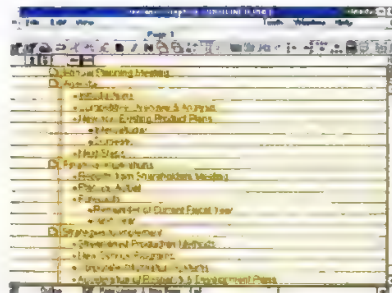
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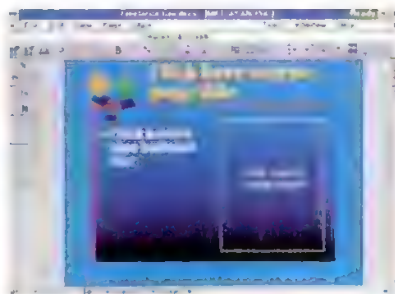
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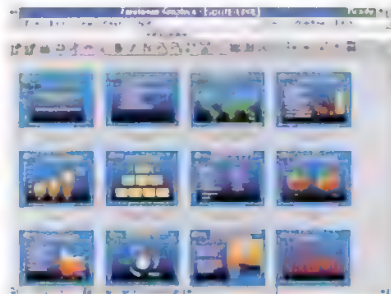
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WordStar for Windows, Version 1.0
WordStar International Inc., 201 Alameda del Prado, Novato, CA 94949; 800-227-5609, 415-382-8000.
List Price: \$495.

Requires: 2MB RAM, DOS 3.1 or later, Microsoft Windows 3.0.

In Short: *WordStar for Windows, Version 1.0*, which is not a part of *WordStar for DOS*, offers advanced page formatting but only limited editing functions. You can edit only one file at a time, and the interface is awkward. Performance is slow and the first release is too unreliable to trust with crucial data.

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DOS SWAP

Don't expect *WordStar for Windows* to exchange data seamlessly with the DOS version. You can import DOS *WordStar* files with most (but not all) features intact, and *WordStar* veterans can select an optional keyboard layout that incorporates most, but not all, familiar *WordStar* keystrokes. But a move from DOS *WordStar* to *WordStar for Windows* is more disorienting than a move from the DOS to the Windows versions of either *Microsoft Word* or *WordPerfect*.

The program allows warm links to non-Windows applications (and DDE links within Windows), but the README file warns that warm links may not work properly with files imported from *WordStar for DOS*. Unlike the programmable mail-merge constructed with dot commands in the DOS version, the Windows version's merge is fully menu-driven, down to the insertion of variables, but completely lacks programming features. You can merge from dBASE data files or files created by DOS *WordStar's MailList* program, but you can't merge from the keyboard or use any filters to select records, and you can only merge to the printer, not to an editable file.

TEXT-EDITING POWER

Like *Legacy*, *WordStar for Windows* is strongest in formatting text and weakest

in editing it. On-screen formatting tools include vertical and horizontal rulers that you can position over the text, a style bar (like *Word for Windows's* ribbon), a status and help menu, and a toolbox that can't be customized by the user. You can position frames, borders, and tables to a precision of a thousandth of an inch (*WordPerfect for Windows* betters this with $1/1,200$ of an inch, if you really need it). Border lines can be single or double, with customized thickness, and you can set the radius of rounded corners. Text formatting includes an option to begin a paragraph with a drop cap or a whole word in dropped caps.

WordStar for Windows supports numbered lists and paragraphs, cross-references, dictionary-style headers or footers, and footnotes. Indexes and tables of contents are awkward to create—you have to export the index or table and then import it again—and index-entries that cover multiple pages are impractical. You can only create endnotes in draft view and you can't create a collapsible outline.

Text can be formatted either with direct menu commands or by using styles that can be unique to a document or stored in a template. You can assign styles to function keys. About 40 templates come in the package, which you can modify or replace, or you can create styles on the basis of direct formatting. If you modify or create styles while working in a document, you can only save them to a template by first saving the document as a template and then removing any text and graphics that you don't want to see in other files built from it.

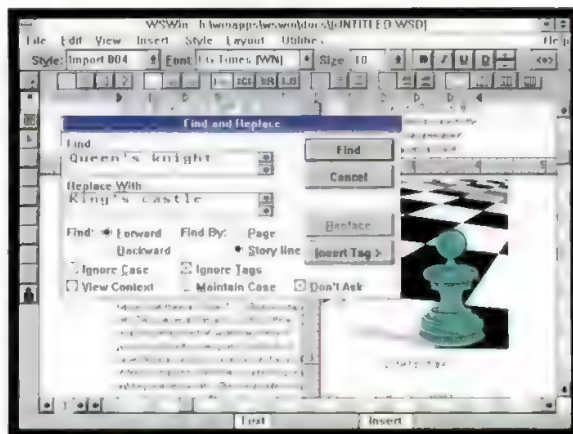
When you work in the program's WYSIWYG view, you edit headers and footnotes in place, and the cursor jumps

across page margins when you reach the end of a page. On a standard VGA system, the smallest facing-page view lets you edit parts of four pages on one screen. When you switch to the unformatted draft view, you use Windows' proportional system font. You can work quickly in draft view, but because Undo doesn't function there, you also work dangerously. If you press Ctrl-A to select your full text while in draft mode, and then press Del, your file is gone forever.

EDITING DIFFICULTIES

WordStar for Windows makes editing more difficult than most other Windows programs. This is partly because you can't work with two files at once; partly because you can't record or program macros; and partly because you can't select text with an extend-selection key as in *Word for Windows* and *WordPerfect for Windows*. You can define a block using standard Windows methods (click-and-drag or shift-cursor keys), but not with DOS *WordStar's* Ctrl-KB and Ctrl-KK. Two or more mouse clicks select the current word, sentence, or paragraph; but the keyboard offers no precise equivalents—only shortcuts that select from the cursor position to one end of a word, sentence, or paragraph without necessarily selecting the whole.

When you perform a spell-check or search, the program doesn't automatically adjust the screen so that the part of the file with the flagged word or search string isn't obscured by the menu. You usually have to move the menu with the mouse to see the word you're looking for. You can, however, search and replace virtually all attributes, including fonts, and the spell-checker sensibly defaults to the Ignore-this-word option. A copy of *Correct*



Many of the menus in *WordStar for Windows* display unattractive fonts when you enter search words or similar strings. This font is inherited from *Legacy, Version 1.1*, the program on which *WordStar for Windows* is based. If the text you search for is behind the search menu, the menu will move out of the way to let you see the text.

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CONVERTING GUI WORD PROCESSORS

In its first release, *WordStar for Windows* often seems unstable; its lack of advanced features limits its strongest appeal.

Grammar for Windows comes with the package and can be run from the menu, but it isn't integrated into the word processor like the grammar checker in *Word for Windows*.

A WINDOW OF INSTABILITY

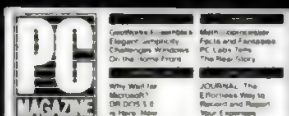
In its first release, *WordStar for Windows* often seems unstable. The program sometimes reports a read error when it tries to save a file, and then refuses to save the file even under a different name. Exporting to a different format will often rescue the file. After you open a number of files during a single session, the program often begins to run erratically: When you open a file, an error message appears, stating that spell-checking can't be performed; eventually a fatal error message appears and the session is over.

If your printer driver isn't the same version of the LaserJet III driver used to create the supplied templates, you'll get an error message and have to select a printer every time you open a file. The helpful README file explains the unintuitive steps needed to eliminate this message.

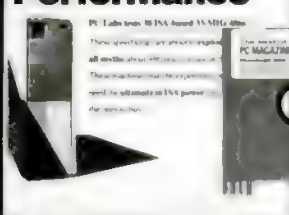
WordStar for Windows lagged behind most other programs in PC Magazine Labs' tests, and swallowed up more system resources than any other package. Its slow performance, inability to work with more than one file at a time, and lack of advanced features combine to limit its strongest appeal to users who require *WordStar* keystrokes in a Windows program—and those who are content to use a set of those keystrokes that isn't even complete.

Edward Mendelson is a contributing editor of PC Magazine.

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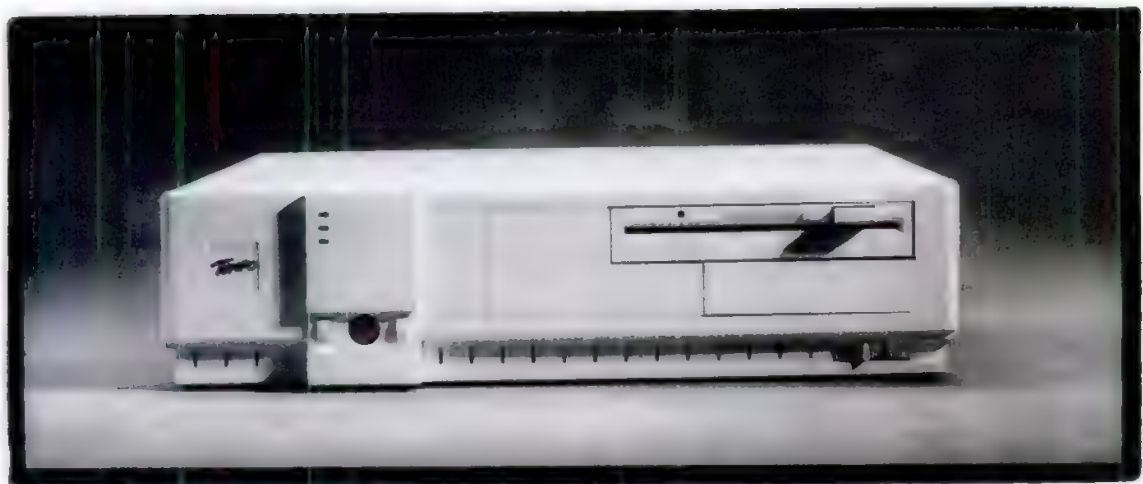
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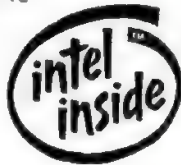
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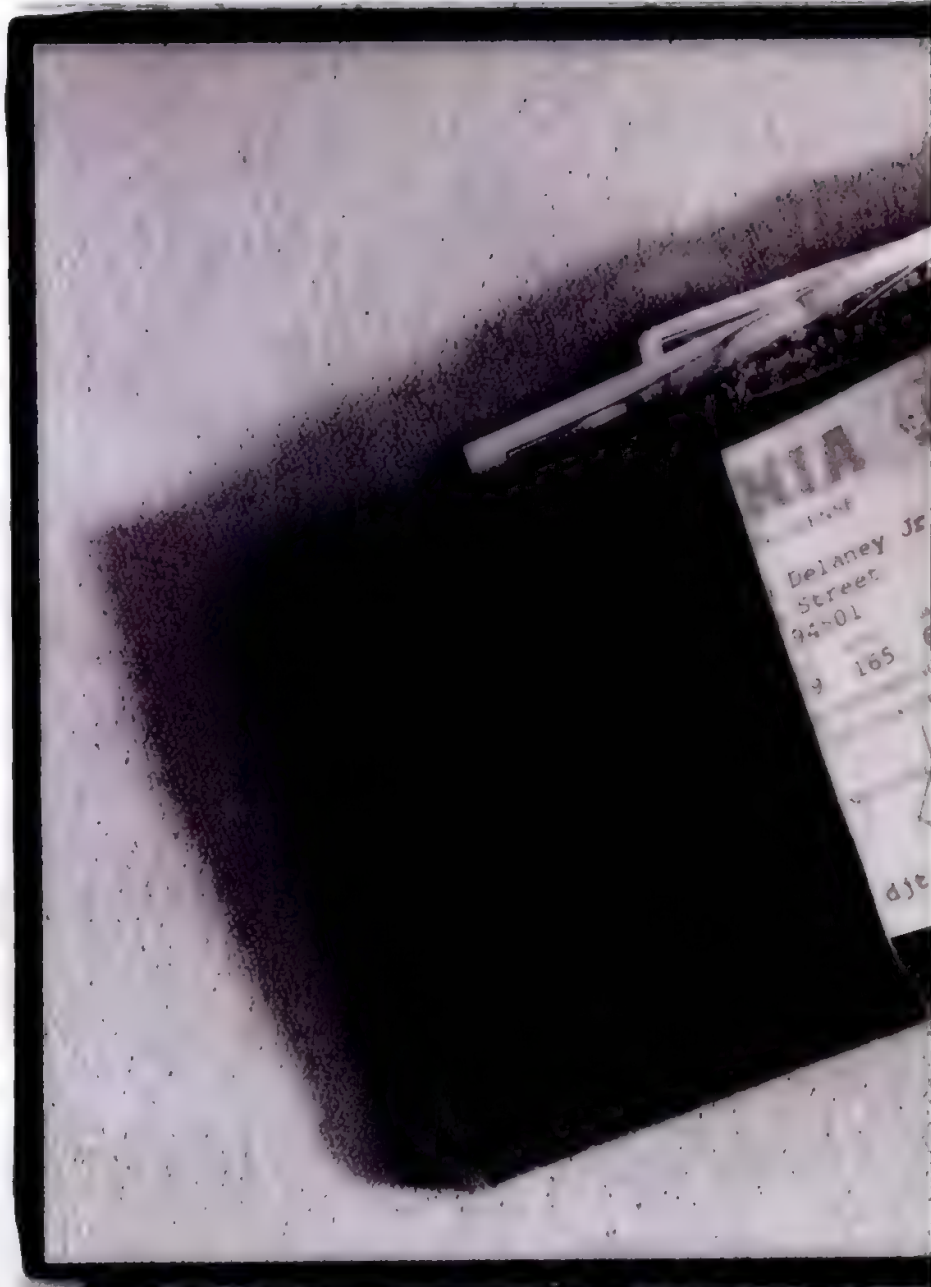
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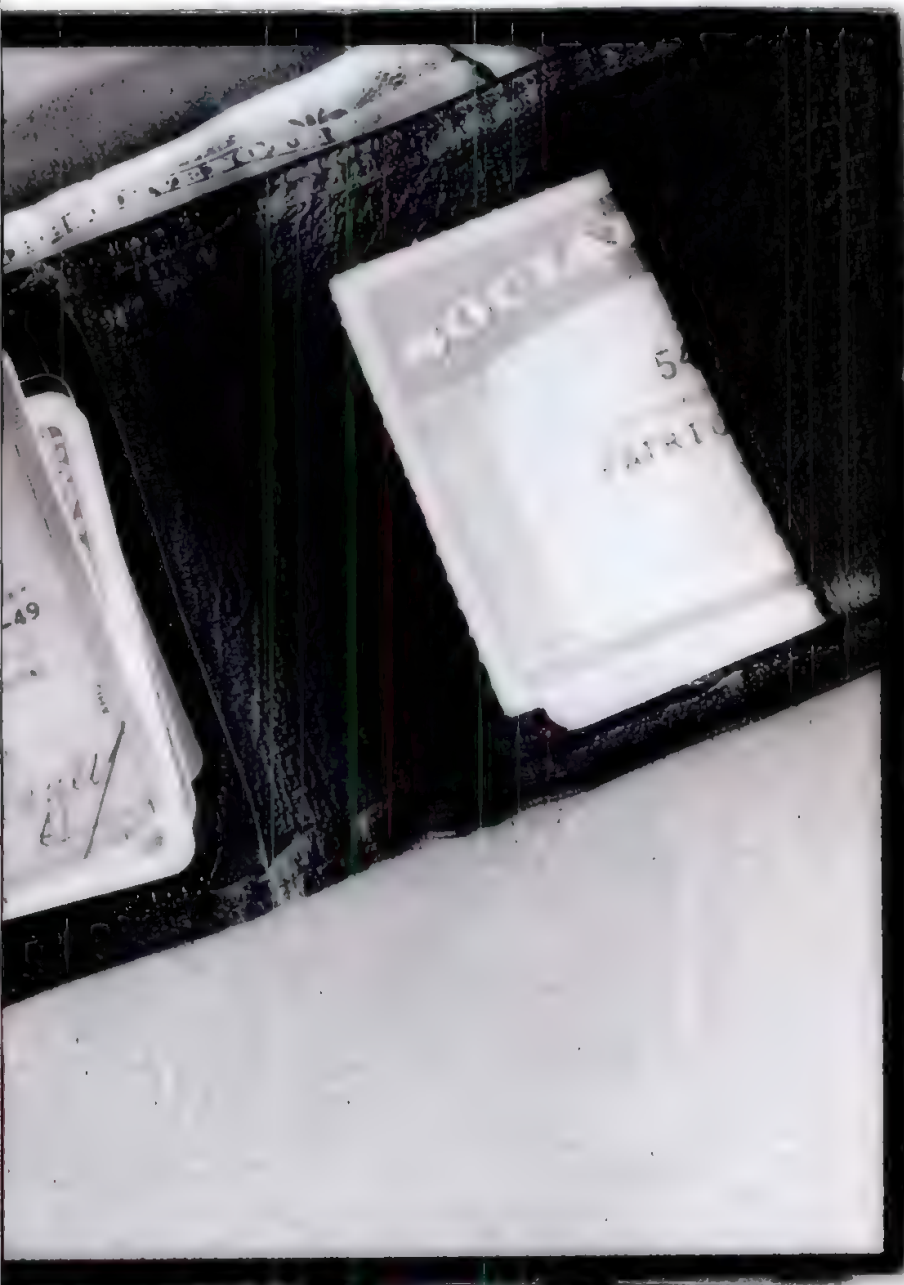
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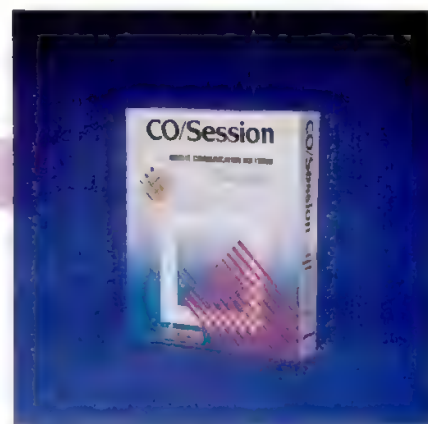
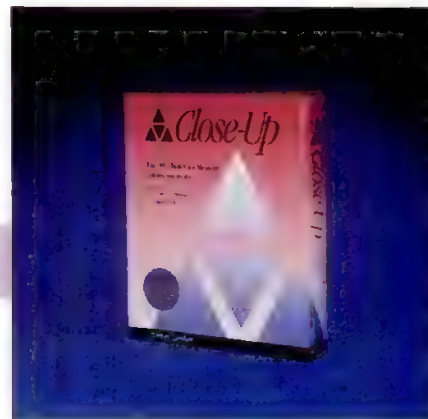
PRODUCTIVITY FROM AFAR

Modem Remote-Control Software

by Carol Ellison

Whether used for telecommuting, work on the road, or technical support, these eight programs let you control a distant PC for safe remote access to files, electronic mail, and office-based peripherals. Even Windows applications—for four of these products—are no longer out of reach.

The difficulty of being in two places at once—of finding yourself on the road when there is a user to help or a problem to troubleshoot back in the office—has always troubled MIS managers, help-desk personnel, and systems consultants. But the advent of laptop and home computers and the increasingly popular practice of telecommuting—working from one place when the work you need to do is at another—has turned this dual-location dilemma into a problem known well by



COMMUNICATIONS

REMOTE-CONTROL SOFTWARE

ever-growing numbers of PC users.

Fortunately, there is a solution. For years, consultants have known that remote-control software running on one modem-equipped PC can serve as a long-distance data link to any other PC running the same software. Consultants could dial up a distant PC, log on as a guest, and take control of the host system. Through this software they could see exactly what was on the screen of the host system, diagnose problems faced by the host's user, compare notes with the user through Chat windows, and even install new files and software using the included file-transfer functions.

More recently, these programs have worked their way into the community of general users who have found them useful in communicating with their office computers from their laptop or home PCs. The same features that once charmed only consultants are ideal for workers who do not want to ferry around floppy disks that easily could be lost or left behind. Users can log on to a PC and then on to a network to check e-mail while traveling, to retrieve files, to communicate with someone back in the office, or to revise and recalculate a spreadsheet and then print the results on the host's laser printer. They can also enjoy the processing power of faster machines or the wealth of peripherals such as CD-ROM drives that would be otherwise unavailable.

Covered in our review (prices are for a combination host/guest package) are US Robotics Software's \$295 *BLAST Professional DOS*, Microcom's \$199 *Carbon Copy Plus*, Central Point Software's \$129 *Central Point Commute*, Norton-Lambert's \$199 *Close-Up*, Triton Technologies' \$195 *CO/Session*, Ocean Isle Software's \$195 *ReachOut*, Digital Communications Associates' \$195 *Remote2*, and SoftKlone's \$179 *Takeover Lite*. Half of the companies also market the guest and host programs separately, with the host-only software available for *BLAST*.

All these products allow access to a host PC only to users who enter the proper password. Some, such as *BLAST* and *Close-Up*, allow the host user or system administrator to grant guest users only the right to view files on the host.

The growing attraction of remote-control software is evident in another product as well. Central Point Software has built portions of *Commute*'s remote-control artistry into its popular *PC Tools* utilities.

DISTANT CONNECTIONS

Remote-control software is typically loaded on the host; it runs as a foreground or, if someone is working at the keyboard, as a background operation and waits for incoming calls. Many of the programs can be configured to flash pop-up messages that let the host accept incoming calls from a guest or to answer automatically if no one is at the keyboard. In the preferred latter method, the unattended PC is left operating after working hours with its modem in auto-answer mode. Password protection keeps uninvited snoops from gaining access to the PC and its data.

The remote-control programs we tested provide the ability to transfer files and guarantee security with features such as password protection and dialback. Screen blanking and keyboard locking are other nice options. Granted, host users can guarantee even better security by locking their keyboard with its key and turning off the monitor. But the options provided by these programs are handy because they enable the guest to do the same from a remote location; this ensures that no one can interrupt the remote session if the keyboard happens to be unlocked or the screen turned on.

Two products that are equally as capable on those fronts, but not included here, are Microcom's *Carbon Copy for Windows* and Symantec/Peter Norton Group's *Norton pcAnywhere 4.5*. *Carbon Copy for Windows* was under development at the time of this review (it began shipping in late November); *Norton pcAnywhere 4.5*, purchased from Dynamic Microprocessor Associates (DMA) in August, was undergoing a complete rewrite to add Windows support. See our look at the beta versions of both products in the sidebar "Two Remote-Control Competitors Add Windows Functionality."

Also missing from this roundup are Concept Development Systems' *Sparkle*, Cross Communications' *Cross+Touch*, Hilgraeve's *HyperAccess/5*, and Palisades Research's *Quasimodem*. These remote-control programs in-



RATING THE PRODUCTS: SUITABILITY TO TASK

There is no universal user of modem remote-control software. File transfer is important for many, but other users are more concerned with how the program interacts with the configuration and applications of the PC into which they will be dialing and whether it will avoid lock-ups during a call.

File transfer rates the function closest to a standard communications software program: the ability to transmit files smoothly and reliably between host and guest machines.

DOS 5.0 Shell judges the product's ability to run DOS 5.0's DOSSHELL utility, load *Lotus 1-2-3 3.1* and *WordPerfect 5.1*, and operate both (with mouse as well as keyboard on 1-2-3). The product switches between the two applications during testing.

DESQview tests how well the product allows multitasking between *Lotus 1-2-3* and *WordPerfect*, and whether it allows zooming in and out of *DESQview* windows. *Lotus 1-2-3 3.1* operates in protected mode and thwarts the proper operation of a task-switching program such as *DESQview*; our rating does not fault the product for problems associated with 1-2-3.

Windows rates the product's ability to transmit Windows screens to the guest PC through the loading and operation of *Lotus 1-2-3* for Windows, *Microsoft Word* for Windows, and a DOS window. It also tests the program's ability to print a *Lotus* file using the *Windows Print Manager*.

SUITABILITY TO TASK	
Product Name	
File transfer	4—Excellent
	3—Good
	2—Fair
	1—Poor
	N/A—Not applicable: The product does not perform this task.
SUITABILITY TO TASK	
Product Name	
File transfer	
DOS 5.0 Shell	
DESQview	
Windows	
N/A	

clude many features found in the products we reviewed but do not give the guest the ability to disable a monitor: a criterion for this roundup. Note that the ability to disable keyboards and monitors is not necessary if the remote-control programs are on asynchronous communications servers. Products lacking this defense offer other security options aiding remote control over a communications server.

Products such as *Sparkle*, as well as those in our review, can run on asynchronous communications servers. Cross Communications' *Cross+Touch* 2.6, in fact, is designed to support up to four communications ports on a server and to redirect incoming communications in the background to PCs on a LAN.

The list of excluded products also includes Micronet's product of the same name, which offers remote-control but no file-transfer capabilities.

SECURING DATA

In addition to passwords and keyboard and screen security, remote-control products secure the host PC's data through a feature called *dialback*. This feature also saves a great deal of money (or at least time spent filling out expense forms) for users remotely dialing into the office—and is a small price for a company to pay for increased productivity.

With dialback enabled, the host checks passwords of guest users who call in, hangs up, and then calls back the user at a phone number that was previously assigned to the password. Phone numbers and passwords are kept in the software's phone book of authorized users. A separate password, known only to the person who installed the software or administers the PCs, protects the phone book and other configuration parameters so that invaders cannot change or even view them.

Some packages, such as *Central Point Commute*, further protect the data on the host with built-in virus protection; *Commute* scans uploaded files and can suspend the transfer if an infection is found. Others, such as *CO/Session*, *Remote²*, and *Takeover Lite*, can limit a guest caller's access to the host to certain drives or directories. Script languages, which can be included with a program or offered as an option, allow a manager to launch a certain application whenever specific users log on (perhaps terminating the connection when the user quits to DOS). The manager can also use script languages to restrict users to only certain operations.

Other common features are call activity logs, which record activity on the guest and/or host PCs. The programs typically

offer a small number of terminal emulations and asynchronous access to on-line services, X.25 PADs (packet assemblers/disassemblers), and time-sharing systems. And most let a guest user capture screen



EDITORS' CHOICE

- *Close-Up*
- *CO/Session*

Among the eight modem remote-control programs reviewed by PC Magazine Labs, two are clearly superior. Consider Norton-Lambert Corp.'s \$199 *Close-Up*, Version 4.0, if you want the best all-around remote-control package or Triton Technologies' \$195 *CO/Session*, Version 6.01, if you work primarily in the Windows environment.

What makes a particular modem remote-control package worth recommending? It begins with the actual connection, from the product's installation and ease of use to the initial handshake and beyond, to logging onto your office's network. It involves smoothly running all the applications to which you are accustomed, whether they are DOS- or Windows-based. And it continues with using, trouble-free, the trickier sleight-of-hand characteristics of programs such as *DESQview*, the DOS 5.0 Shell, and *Lotus 1-2-3*. Lastly, it involves file transfer, perhaps the most basic function yet among the most popular.

Close-Up and *CO/Session* clearly represent the best of the bunch across all these criteria. Once we went beyond the effortless installation and comprehensive documentation, *Close-Up* demonstrated many thoughtful touches that help the program excel. These include an automatic shut-off of data compression when the program senses a compressed file, a graphics screen refresh that communicates only screen changes (rather than full screen updates), and a proprietary data compression scheme that cuts error-correction time. Other impressive features in *Close-Up* include built-in CRC virus control and the ability to restrict user rights through password assignments.

If your usual applications are Windows-based, you may wish to

consider *CO/Session*. *CO/Session*'s Intelligent Graphics technique updates Windows screens by sending code, not bitmapped screen changes, across the line; this results in swift screen updates. File transfer is a snap owing to an *XTree*-like Files menu that lets you tag files for local copy, move, and delete operations, as well as for file transfer. *CO/Session*'s ample security options go the extra step of letting a systems manager write batch files for individual users. These routines can take the user into a specific application once the connection is made and terminate the link if the user attempts to exit to DOS.

Granted, even these two programs could use further improvement. *Close-Up* requires you to type in filenames for transfer on an individual basis, and the mouse operation takes some getting used to. *CO/Session*'s efficient screen updates are designed for Windows use; when running DOS-based graphical programs, the program was noticeably slower. And you will have to turn off the program's compression before trying to send compressed files or *CO/Session* will attempt to compress them a second time.

Two notes that could affect your buying decision: *pcAnywhere*, one of the market leaders, was acquired by Symantec and should be out shortly in improved form, and a Windows-based version of Microcom's *Carbon Copy* will be available by the time you read this. Both are worth a look (see the sidebar, "Two Remote-Control Competitors Add Windows Functionality"). Also, if you do considerable desktop-to-laptop file transfers and you want the same capabilities across a modem line (and nothing more), Traveling Software's *LapLink Pro* does both with the same interface.

images from the host. *Close-Up* and *BLAST* offer the ability to capture multiple screens for playback in a kind of movie-camera recording session, useful for troubleshooting a problem on the host system or for recording a session to conduct long-distance demonstrations.

Of all the additional features that come with remote-control programs, the most commonly used is file transfer. But if you need nothing more than the ability to swap files among remote PCs, your best bet may be Traveling Software's *LapLink Pro*. *LapLink Pro* features speedy file-transfer capabilities and a handy mechanism that gives users the ability to install *LapLink* on a distant host PC. (See the sidebar "LapLink Pro: Full-Featured Support for Simpler Needs.")

WORKING WITH WINDOWS

While these products let you run applications by using the guest PC as a kind of remote terminal for controlling what happens on the host, on-line work is still not practical for most users. This is due to the speed with which the screen of the guest PC redraws the changes occurring on the host. The guest screen can only change as quickly as it receives information from the host. This speed is limited by the data-carrying capacity of the telephone lines and the speed of the modems.

Unless you are using a 9,600-bps modem or, better, one of the new high-speed 14.4-Kbps V.32bis models, it is not realistic to use these products to do more than transfer files, check e-mail, or run applications for remote print jobs and remote processing power. (Look for the roundup of V.32bis modems scheduled for our March 17, 1992, issue.) Waiting on screen updates is too tedious to consider using these products to compose long documents or large spreadsheets. In such cases, it is far better to create the files on a remote PC and then transfer them to the host.

These programs send information on changes to the host's screen display over the phone line to the guest and relay keyboard commands from the guest back to the host. In DOS's character-based world, this basically amounts to an exchange of keystroke information that readily travels the phone line. But graphical interfaces and applications place bitmap images on-screen that redraw the screen with large bitmap images, not characters; these pose special challenges to remote-control programs. Until recently, few were able to

transmit only screen changes when Windows or graphical DOS applications were run remotely.

In this review, in fact, we paid particular attention to how these products support viewing and controlling Windows and other common applications running on the host in Standard, Real, or 386 Enhanced mode. (We also looked at remote mouse support.)

However, even the products that featured the best Windows support—*Close-Up*, *CO/Session*, and *ReachOut*—repainted screens at tolerable speeds when we ran them at 19,200-bps RS-232 line speeds between two PCs equipped with US Robotics V.32bis modems. None of the companies recommend running remote Windows operations at speeds slower than 9,600 bps.

One of the products, *ReachOut*, can load on the host as either a DOS or Windows application. The others programs that support Windows load in character mode on the host, wait for the guest's call, and at the connected guest's command load Windows. All products run in DOS character mode at the guest PC, although the distinction becomes unclear once you are logged on to a host and running a Windows application.

Close-Up, which shipped last July, was the first modem-to-modem remote-control product capable of the task. *Close-Up* is as comfortable with Windows- and DOS-based graphical applications as it is with character-based DOS applications, and it still stands out from other Windows-compatible newcomers.

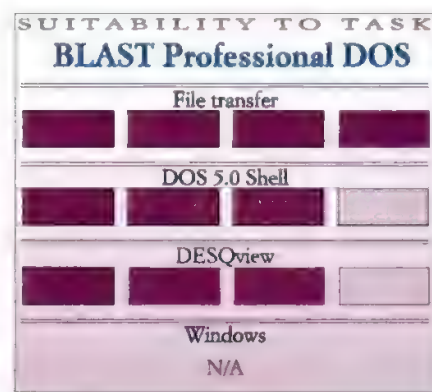
Remote-control software has come a long way, even in the short time since we last looked at it. (Examined in the sidebar "Modem-Based Remote-Control: The Serial Alternative" in the story "Reaching Out with LAN Remote-Control Software," *PC Magazine*, July 1991.) Since then, many of the vendors have made their products Windows-compatible or added special Windows versions to their product line. And the improved video handling of most of the reviewed products has made them better able to run DOS applications.

There are still numerous differences in file-transfer speeds and the range of data security options and utilities that the programs offer. But whatever your need for remote-control software, you are bound to find something suitable among the products reviewed.

BLAST Professional DOS

by Angela Gunn

If the remote-control field were paved and made into a parking lot, *BLAST Professional DOS* could be a Mack truck—tricky to drive at first, but powerful. The \$295 program moves mission-critical files reliably and reasonably quickly. Created by Communications Research Group, a company recently bought by US Robotics Software, the program is capable of communicating with systems including OS/2, Unix, and VMS. *BLAST* will move docu-



ments from any point to almost any other point, although it does not yet support the Macintosh, and the version we tested does not support Windows.

Installation is no problem. The quick-install guides for the *BLAST* remote and BHOST host programs are sensibly written and easy to follow. Best of all, they warn you about what information you will need to set up the program. The package comes with one 5.25- and one 3.5-inch disk; pop one into your drive, type INSTALL, and the program will query you for the information. And if hardware changes occur at a later date, the program is easy to reconfigure. It uses 83K of RAM on the host side and 384K of RAM on the guest.

POWERFUL SCRIPTING

Setting up dialing scripts in *BLAST* is fairly simple and, if you need complex scripting, extremely powerful. You develop basic configurations on a screen that allows you to see nearly all of the many parameters, from the name and phone number of the desired script to the degree of proprietary compression that

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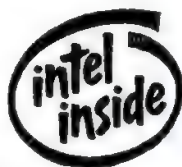
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COMMUNICATIONS REMOTE-CONTROL SOFTWARE

you have selected. For more complex scripts involving unattended transfers or on-line searches, there is **BLASTscript**, a BASIC-like programming language. It's fairly robust, and a good portion of the hefty documentation explains how best to use this resource.

Once you get to the program, the mood darkens considerably. **BLAST**'s menu-driven interface provides decent on-line help, but even general navigation is arduous. The screen gives a great deal of information about the status of the session and the configuration you are using. But despite the Windows-like bar menu at the top and mouse accessibility, the menus are terse and somewhat oblique. You will adjust once you have spent time with the program, but **BLAST** is not intended for the casual user.

In addition, this program exhibited one irritating design quirk: Hit the Esc key once too often and you will be disconnected. **BLAST** asks for confirmation when you are exiting the program itself; there is no reason not to give the connection similar protection.

Protection is terrific on the host side, though: **BLAST**'s security is excellent. **BHOST** allows various levels of user access and provides the option to set up various sensitive areas for password-only access.

Remote control with **BLAST** went smoothly after technical support confirmed that they did not recommend using the program to run Microsoft Windows. **BLAST** does not entirely ignore graphics, though; it is possible to look at .GIF and .PCX files over the line. One option allows the guest to specify the percentage of pixels to be translated over the line (be-

tween 1.5 percent and 100 percent); this is not good for minute viewing, but is excellent for a quick look at a graphic. The program performed efficiently in the DOS 5.0 Shell and **DESQview** environments and had no trouble attaching to a LAN over a remote modem connection.

RELIABLE TRANSFERS

File transfer with **BLAST** was above average on our performance test, perhaps thanks to the sliding-windows and full-duplex design of the **BLAST** (BLocked ASynchronous Transmission) proprietary protocol. Speed was particularly notable with **BLAST**'s variable-level compression in use. The transfers themselves are bulletproof: If a file transfer is interrupted by a disconnect or other line trouble, the machines can resume transmission mid-file. Zmodem protocol is also available.

Frequent users will appreciate **BLAST**'s robust logging function. In addition to information on session duration and user names, the log can detail the condition of the line, the type of connection made, the name and size of the transferred files, and the number of messages sent and received. The log is set up to be parsed by analysis programs, so the data generated can be used efficiently.

BLAST's tutorial makes use of the company bulletin board, Demoline, which provides information on changes to **BLAST** as well as demonstration and testing areas. (A Demoline dialing script is included in the package.) US Robotics also offers technical support at a toll number from 8 A.M. to 6 P.M. C.S.T. Beyond the quick-start guides for the **BLAST** guest



BLAST Professional DOS, Version 10.5.1
US Robotics Software, 5615 Corporate Blvd.,
Baton Rouge, LA 70808; 800-242-5278, 504-
923-0888.

List Price: Host only, \$99; host and guest,
\$295. Server license, \$695.

Requires: Host: 83K RAM, DOS 3.0 or later.
Guest: 384K RAM, DOS 3.0 or later.

In Short: Plain but powerful, **BLAST Professional DOS** may be intimidating for the novice user. The menu borders are kludgy and there is no support for Microsoft Windows. Users requiring flexibility, interoperability, and virtually bulletproof transmission, however, ought to consider this package.

CIRCLE 480 ON READER SERVICE CARD

and **BHOST** host modules, the user manual and reference guide are thorough, if poorly indexed.

BLAST is not for the fainthearted. But if you are looking for a sturdy file-transfer and remote-control setup and care about any environment but Windows, it's worth your time to learn to drive this vehicle.

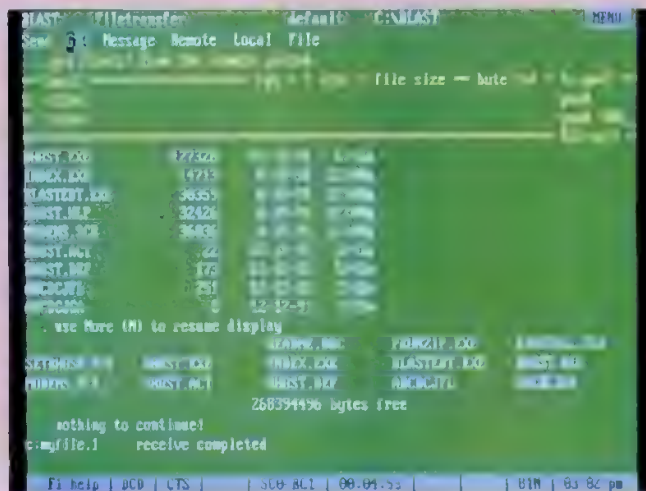
Carbon Copy Plus

by Michael Cohn

All-in-one packages offer convenient advantages. Version 6.0 of Microcom's venerable *Carbon Copy Plus* delivers a comprehensive communications solution that includes a modem remote-control program, terminal emulator, and LAN remote-control software: all for a reasonable \$199. The nonnetworked modem remote-control portion lacks mouse and Windows support and its file-transfer options are limited, but *Carbon Copy Plus* provides excellent file-transfer speed and a helpful assortment of features.

The main menu screen on the remote side displays two chat windows that you can use for calling an attended host system. From the main menu, you can choose to log sessions to disk and replay them and to capture individual screens. The program uses 170K on the guest side and installs as a 60K TSR on the host.

BLAST Professional DOS, shown here during a file transfer session, gives copious amounts of information about your connection and the progress of your transfer. The menu shown at the top of the screen, however, tends toward the oblique.



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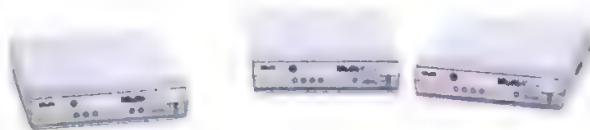
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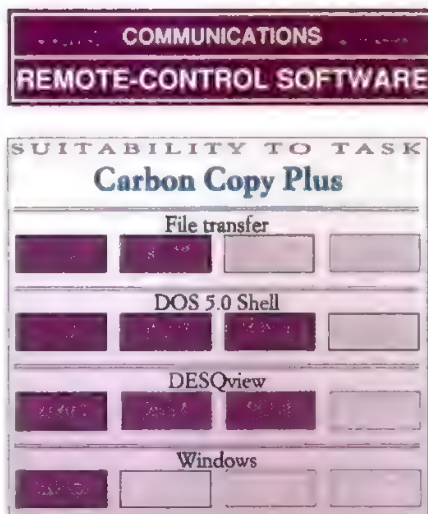
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Carbon Copy installs fairly easily, and displays a list of 51 modems and modem types. If you cannot find your modem, you can choose a compatible one, though you may not get the best throughput. Microcom will provide free descriptor files for additional modems, but the program will not allow you to edit the modem initialization string yourself. After Microcom sent us a descriptor for our comparatively new modem, we recorded some of the fastest times on our file-transfer test.

Once the setup is running properly, you can take better advantage of the proprietary protocol's compression technique: run-length encoding. There is no option to turn off compression unless the software encounters MNP7 compression in the modems (in which case you have automatic shut-off). But this lack did not slow down our compressed file-transfer test, where *Carbon Copy* posted the fastest time. The terminal emulator function also adds variations of Kermit, Xmodem, and Ymodem protocols to allow file transfers from systems running standard communications software.

Several remote-control packages display split screens that show host and guest drives and directories, which allows you to tag files for transfer. *Carbon Copy* instead relies on a DOS-like COPY command that you type at the command line. You can incorporate wildcard characters in the filename if you want to transfer more than one file with a similar filespec, but the approach remains awkward.

A couple of options are available to speed up screen displays. You can disable synchronization between the guest and remote sides, which avoids wasting time



updating the guest's screen after each and every change in the host's display. You can also decide whether you want to save refresh time by having only half the pixels in graphics screens displayed. In both cases, you make trade-offs between speed and readability. When repainting a graphics screen, *Carbon Copy* wipes the screen from top to bottom one color field at a time. On a slow connection, this can take uncomfortably long, but at high speeds, it is less nerve-racking.

TRANSITION TO WINDOWS

Our testing period caught *Carbon Copy* in a transitional phase. Only the Carbon Copy LAN part of the package provides true Windows and mouse support, allowing control over a host running Windows in Real, Standard, or 386 Enhanced mode over a network. Nevertheless, we managed to manipulate *Lotus 1-2-3 for Windows* and *Microsoft Word for Windows* by keyboard over the modem connection, and we sent output to a printer connected to the host. But the host screen

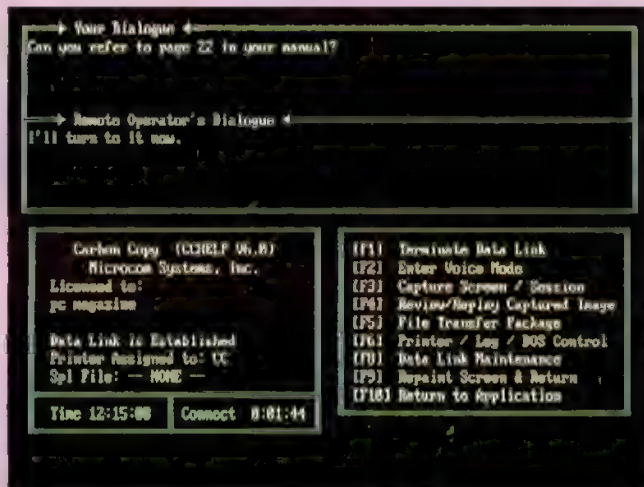
remained effectively blank until we exited Windows. We also looked at a pre-release version of Microcom's *Carbon Copy for Windows*. It adds Windows and mouse support along with split-screen file transfers, but it was not ready in time for formal testing. (See the sidebar "Two Remote-Control Competitors Add Windows Functionality.")

Carbon Copy Plus worked with barely a hitch under DOS 5.0's DOSHELL task switcher. Although we could not use a mouse, we loaded *Lotus 1-2-3* and *WordPerfect* at the guest keyboard and succeeded in switching directly from one to the other. But we needed to install 1-2-3 in EGA mode on our VGA machine to make it display more than a small portion of its screen.

Carbon Copy supports *DESQview* and *QEMM*, which permits you to load it into high memory. But after we loaded 1-2-3 under *DESQview* and tried to open a second window, the guest computer locked up. (Microcom is already distributing a patch for *DESQview* that it intends to incorporate in *Carbon Copy*'s next release. This patch partially remedies the 1-2-3 problem.) *Carbon Copy* did perform well at loading and multitasking *WordPerfect* and other programs, including *Microsoft QuickBASIC*.

The modem remote-control portion of *Carbon Copy* passed the network attachment part of our testing by successfully connecting to a host PC, and from there logging on to a server. The full-fledged

The guest user's side of *Carbon Copy Plus* includes options on its main menu for calling another machine that is running *Carbon Copy* and for going into terminal emulation mode to call a different type of host. *Carbon Copy* also displays chat windows for use at attended host and guest PCs.



Carbon Copy Plus, Version 6.0

Microcom Inc., 500 River Ridge Dr., Norwood, MA 02062; 800-822-8224, 617-551-1000.

List Price: Host only, \$119. Guest only, \$119. Host and guest, \$199.

Requires: Host: 60K RAM, DOS 2.0 or later. Guest: 190K RAM, DOS 2.0 or later.

In Short: A reliable and serviceable modem remote-control program with limited but speedy file-transfer features, *Carbon Copy Plus* includes a useful LAN remote-control program. But if you want mouse support and full Windows support, you will need *Carbon Copy for Windows* instead.

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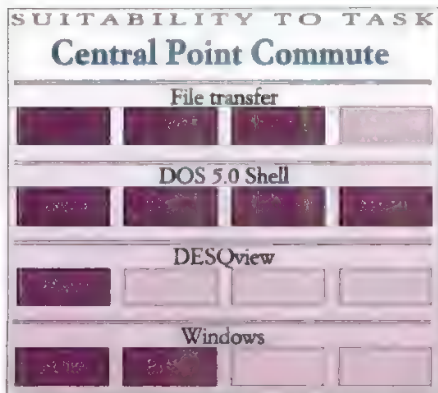
The program includes security features such as dialback and two levels of password protection. One allows authorized remote users full rein over the host system, while the other limits them to file transfer to and from the call-in directory. You can assign individual passwords to each remote user.

Carbon Copy's documentation presents helpful and well-organized information, but on-line help is sparse. If you need assistance, Microcom supplies free technical support at a toll number weekdays from 8 A.M. to 7 P.M. E.S.T. *Carbon Copy Plus* offers a reliable remote communications solution to fit a variety of needs. If you are mostly interested in running non-Windows applications or in connecting by modem to your LAN, it will do the job well.

Central Point Commute

by Wendy Dugas Pérez

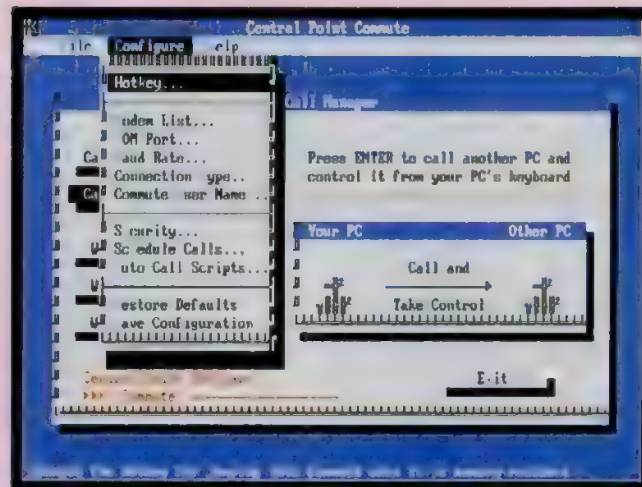
If you are tired of commuting via planes, trains, and automobiles, Central Point Software's *Central Point Commute* will control a remote PC from wherever you are. For \$129 you get a bargain (\$179 if



you purchase it with *PC Tools 7.1*), although the product's features and performance sometimes reflect its low price.

The makers of *Commute* built flexibility into the product by allowing each PC to function as either a host or guest using the same software. You can run the program

COMMUNICATIONS REMOTE-CONTROL SOFTWARE



Central Point Commute's menu interface includes an option that allows you to change its hotkey and run the program in resident mode to save memory.

either as memory resident (using from 15K to 60K) or in the foreground, in which case it needs 510K of RAM on the host side and 460K RAM on the guest side. The program can use extended or expanded memory to eliminate the 600K of hard disk space it would otherwise need for swapping to disk. The program files take up approximately 900K of hard disk space.

While *Commute's* interface is easy to use, it does not provide as many options as you will find in some of the other packages. There are no file manager capabilities and, although you can set user restrictions, *Commute* does not provide any form of security for drives, directories, or files. The program does not offer a voice switch or any terminal emulations or file-transfer protocols.

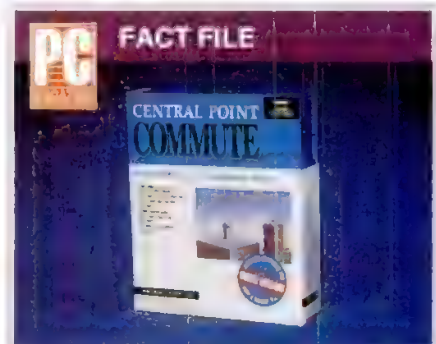
On the plus side, *Commute* does supply users with an easy-to-use chat mode and logging capabilities. You can write scripts that will enable you to automate sessions and a scheduler lets you make unattended calls at preset times. *Commute* also includes dialback capabilities and a phone directory.

FLEXIBLE TRANSFER OPTIONS

Although *Commute's* file-transfer times were the second slowest among the products we reviewed, the program offers a superior file-transfer interface. You can use DOS wildcard characters to include or exclude files: for example, copying all files except those with the extension .BAK. You have to exit the transmission screen, however, to see a listing of the files on the host PC. When transmitting a file, *Com-*

mute provides a lot of information, including time elapsed, time remaining, transfer rate, and percentage of bytes transferred. You can select many time-, disk-, and sanity-saving options for transferring files, such as compression, automatic overwrite, subdirectory inclusion, virus detection, archive copying, or copying of newer files only.

In our Windows testing, the guest PC could support a remote mouse, but *Commute* had problems with the video on the Compaq Deskpro 386/25e machines at both ends. The host PC's screen became unreadable, and, although the guest PC could display the screen over the remote



Central Point Commute, Version 1.1

Central Point Software Inc., 15220 NW Greenbrier Pkwy., #200, Beaverton, OR 97006; 800-445-4208, 503-690-8088.

List Price: Host and guest, \$129. Bundled with *PC Tools*, \$179.

Requires: Host: 640K RAM, hard disk, DOS 3.3 or later. Guest: 640K RAM, DOS 3.3 or later. Hard disk recommended

In Short: *Central Point Commute* earns praise for its low price, which includes a LAN remote-control product. But the version we tested failed to stand out—particularly with Windows and DESQview.

CIRCLE 481 ON READER SERVICE CARD

connection, it changed the colors: for example, showing only shades of gray and the color red in *Microsoft Word for Windows*. Graphics transmissions were also very slow. Testing a beta copy of Version 1.2 of *Commute* (due out by the time this issue is published) verified that the video problem has been resolved and graphics transmission speed has been improved.

One slight problem revealed in testing is that if the guest machine runs *Commute* as a TSR, guest mouse support is lost within Windows. To avoid this problem, make sure that the guest PC loads *Commute* from the command line instead of using the hotkey. Using just our guest screen for guidance, we were able to print from Windows, although *Commute* dropped the connection at the end of this process. But the package was unable to shell out to DOS from Windows.

While the Windows guest mouse worked, the mouse would not work from within the DOS 5.0 Shell. *Commute* was able to load both *Lotus 1-2-3* and *WordPerfect* within the DOS Shell, but the colors were slightly off on 1-2-3. And we were only able to toggle among the applications from the host's keyboard, not over the remote connection.

DESQview testing proved to be a stumbling block for *Commute* as well: *DESQview* would load, but would intermittently freeze and lock up the host's keyboard, after which the host PC would have to be rebooted. This would also happen when trying to load an application from within *DESQview*. Also, not only was there no guest mouse support, but *Commute* interfered with the host's mouse and disabled it.

LAN REMOTE-CONTROL

The LAN connection presented no problem for *Commute* and enabled us to log on to the LAN while remotely controlling the host over a modem connection. One of *Commute*'s best features is that it can also function as a LAN remote-control program without requiring you to purchase a separate product.

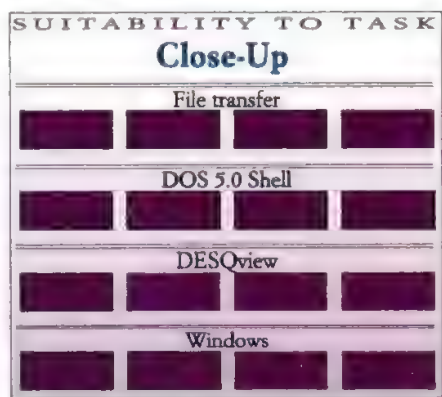
Central Point Commute is a good value, especially if you want a product that can do both modem and LAN remote control. But because of *Commute*'s slow graphics updates in Windows and plodding file-transfer times, as well as its lack of *DESQview* support, Version 1.1 really needs the upgrade to Version 1.2 to make it recommendable.

Close-Up

by Carol Ellison

When Norton-Lambert Corp. released *Close-Up*, Version 4.0, in July 1991, it was the first communications software company to optimize its remote-control program to run Windows from a guest PC. Although competitors have since released Windows-compatible versions, *Close-Up* still leads in general excellence. Its guest and host sides together cost \$199.

Close-Up transferred DOS graphics between our US Robotics Courier V.32bis



modems as handily as it did Windows graphics and posted the fastest speed in transferring an uncompressed text file. *Close-Up* delivered our 150K text file (153,600 bytes) in just 51 seconds, applying its own compression scheme.

AUTOMATED AND INTEGRATED

Norton-Lambert rewrote *Close-Up* for Version 4.0, preserving its colorful blue

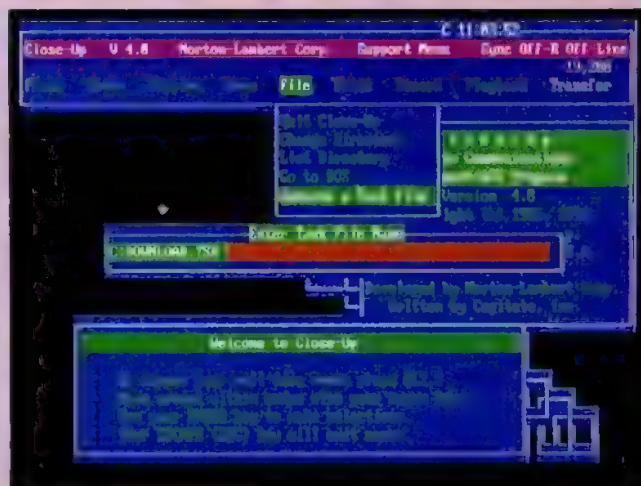
and green character-based interface while streamlining and automating installation and operations. A small but thoughtful addition is *Close-Up*'s ability to detect when it is sending previously compressed files and to automatically turn off data compression to avoid wasting time.

Close-Up achieves its lightning file-transfer speed by using a proprietary data compression scheme with a Sliding Windows protocol. You perform transfers by entering the desired files' path and filenames in the program's Files menu. From there, you can send or fetch files as well as view files in any directory.

Installation is as easy as copying the guest programs; which Norton-Lambert calls "support," to one PC, and host software, called "customer," to another; loading the program; and configuring it for your modem. *Close-Up* directly supports a long list of modems that appear as options on the setup menu. If you do not find yours on the list, you can use the editor provided by Norton-Lambert to add your modem type, initialization string, and speed. On-screen instructions and excellent documentation make this task an easy one. The company will also write initialization strings for customers who supply command summaries of their modems.

In addition to remote control, *Close-Up* includes a Terminal program for communicating with bulletin boards, online and electronic mail services, and time-sharing computers. On the guest, it offers its Automated Communications System (ACS), a kind of scripting language that lets you easily assemble Task Files to schedule and automate unattended file transfers and other remote operations.

Close-Up lets you write Task Files to schedule and automate file transfers. You just choose the Execute a Task File menu selection and type in the name of the task.



The Great Crash Of '91.

Not long ago, the PC world was shaken by the news that a surprisingly well-known communications package had crashed while attempting high-speed file transfers. It was not a pretty sight.

After testing different comm programs, the editors of *PC Magazine* reported that "Procomm Plus" locked up several times during our testing of high-speed file transfers. During our Character-based ZModem tests, on an 8-MHz AT equipped with a 16550A UART, it consistently froze at every port speed faster than 38.4 Kbps on the receiving side of the link."

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PC Magazine tests, but it was one which the editors of *PC Magazine* applauded for performance, price and flexibility.

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The editors of *Software Digest* drew a similar conclusion. They gave Crosstalk Mk.4 the only 4-star rating in their ranking of communications packages. And while Crosstalk Mk.4 proved to be an unparalleled program for power users, its sister product, Crosstalk Communicator, also scored highly in the *PC Magazine* tests.

Crosstalk Communicator received points for "...matching its higher-end sibling, *Crosstalk Mk. 4*, practically score for score." It provides "...a fast, flexible alternative for the budget-conscious, particularly anyone in an organization already using *Crosstalk Mk. 4*, because it can use scripts developed in that program."

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April 1991
Crosstalk
Communicator



April 1991
Crosstalk Mk. 4
Version 2.0



April 30, 1991
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Vol. 7 No. 12 1990
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How To Avoid A High-Speed Comm Crash.

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Screen	9" 32 grey	10" 32 grey	10" 32 grey	9" 32 grey
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CPU Cache	none	none	64 k	64 k
Hard Drive	20 MB IDE	40 MB IDE	60 MB IDE	60 MB IDE
I/O Ports	1 serial, 1 parallel monitor	2 serial, 1 parallel monitor, keyboard	2 serial, 1 parallel monitor, keyboard	1 serial, 1 parallel monitor, keyboard
Screen	10" 32 grey	8.5" 32 grey	10" 32 grey	9" 32 grey
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PC-M0312

THROUGH WINDOWS

Norton-Lambert has done an excellent job of optimizing *Close-Up* to deal with graphical environments and DOS applications running in graphical modes. In traditional character-based DOS programs, *Close-Up* updates the guest's screen primarily by passing keystroke information. It handles graphics by communicating changes to the guest so that only those portions of the screen that have changed are actually redrawn. *Close-Up* further speeds the redraw by compressing the information transmitted. Screen updates in DOS appear as if the information did not even have to travel across the phone line.

Close-Up's screen updates in Windows are certainly acceptable, if not always as fast as programs that bypass bitmapped video information and simply send video function calls, such as *CO/Session*. The disadvantage of that program's otherwise speedy function call-approach is that it only works for Windows and does nothing to speed graphical DOS programs such as *Lotus 1-2-3*, Version 3.0.

Close-Up supports Windows applications in all three modes—Real, Standard, and 386 Enhanced—whether they are running full-screen or within windows. We had no trouble running *Lotus 1-2-3 for Windows* and *Microsoft Word for Windows* simultaneously with Norton-Lambert's package, toggling between them, minimizing the programs, or enlarging them to full-screen.

Less acceptable was mouse movement

Close-Up's security scans the program to detect if its own files have been invaded by any virus.

on the guest. *Close-Up* places two pointer images on the guest screen: One moves at the guest user's command as screen information is updated, the other shows the guest user the position of the mouse cursor on the host's screen. The effect takes some effort to get used to, but it keeps the guest user from waiting for the screen to redraw.

RESIDENT REQUIREMENTS

Close-Up runs as a foreground operation on the guest and requires 153K. But it functions as a TSR on the host and can be configured to consume as little as 34K RAM. You can also load the program into high memory to save space in conventional RAM.

Close-Up features all the security options normally offered in remote programs, including password protection and dial-back, as well as some that aren't so typical. It scans for common viruses during file transfers, performing a cyclical redundancy check on itself to detect if its own executable files have been invaded. In its own way, the program encourages users to take security measures: Until passwords are assigned, users are warned every time they load the program.

Managers can control user rights through password assignments, giving users all or no transfer rights, or permitting them only to send or fetch or view files.

Norton-Lambert Corp. provides free technical support from 7 A.M. to 5 P.M. P.S.T. at a toll number, and it offers a bulletin board. With its expert handling of DOS graphics and Windows applications, as well as its efficient data compression and file-transfer scheme, *Close-Up* is the best bet for anyone in search of an all-around, top-notch modem remote-control program.

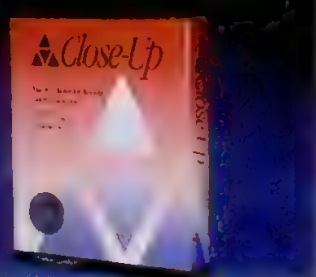
CO/Session

by Carol Ellison

"Intelligent Graphics" may be the most intelligent solution yet for running Windows applications remotely. Intelligent Graphics is Triton Technologies' technique for swiftly moving Windows screen information across a telephone wire from a host PC to a guest. And it helps make *CO/Session* a standout product at a \$195 price.

During installation, *CO/Session* replaces the Windows screen, mouse, and keyboard drivers listed in the host PC's SYSTEM.INI file with the names of the drivers it copies into the WINDOWS\SYS directory. On the guest's side, the program builds its own set of Windows drivers in a file called RWIN.EXE; this must be loaded before the guest logs on to run Windows, although the guest does not need to have Windows loaded as well. Instead of updating bitmap information on-screen as do many other products, *CO/Session*'s Intelligent Graphics puts each set of drivers in communication with one another and updates screens by sending code, not bitmapped screen changes, across the line.

In our tests, *CO/Session* dealt with

FACT FILE
EDITORS' CHOICE

Close-Up, Version 4.0
Norton-Lambert Corp., P.O. Box 4085, Santa Barbara, CA 93140, 805-964-6767.
List Price: Host and guest, \$199.
Requires: Host: 31K to 81K RAM (depending on features loaded), DOS 2.0 or later. Guest: 244K RAM, DOS 2.0 or later.
In Short: *Close-Up* offers handy remote navigation of a host computer's hard disk, speedy file transfer, and efficient handling of graphical applications. You will not find a better all-around remote-control program.

CIRCLE 483 ON READER SERVICE CARD

FACT FILE
EDITORS' CHOICE

CO/Session, Version 6.01
Triton Technologies Inc., 200 Middlesex Turnpike, Iselin, NJ 08830; 800-322-9440, 908-855-9440.
List Price: Host only, \$125. Guest only, \$135. Host and guest, \$195.
Requires: Host: 5K to 75K RAM (depending on configuration), DOS 2.0 or later. Mouse recommended. Microsoft MOUSE.COM or compatible driver recommended for local or remote mouse operation. Guest: 123K RAM, DOS 2.0 or later.
In Short: With exceptionally good handling of remote Windows operations in Real, Standard, and Enhanced modes, *CO/Session* features smooth file transfer and a friendly XTree-like viewer for remote file handling.

CIRCLE 484 ON READER SERVICE CARD

**LOOK WHAT
PC MAGAZINE
HAD TO SAY ABOUT
A VERY GRAPHIC
AND RACY
SUBJECT.**

LAPLINK PRO: Full-Featured Support for Simpler Needs

by Angela Gunn

The convenience of running applications via a modem is often obliterated by the misery of using a slow or even a middling-speed modem. And in many cases, all users need to do is transfer files and perhaps perform simple disk management. If either of these descriptions fit your situation, Traveling Software has a package for you.

LapLink Pro, a descendant of the grand old laptop-to-PC school of *LapLink* packages, incorporates modem capabilities into its powerful file-transfer and management package. You will not be able to run applications; but if you were not planning to run them anyway, this product is just your ticket. *LapLink Pro*, Version 4.0's \$169.95 price buys you a capable, richly featured file-transfer package with built-in relief from the headaches usually associated with communications utilities.

LapLink Pro falls into a gray zone among file-transfer, remote-control, and communications software. From its roots in file transferring, *LapLink Pro* retains a brightly colored set of serial and parallel cables that enables laptop-to-desktop transfer. From communications software, *LapLink Pro* draws its modem-to-modem transfer ability. And it shows its kinship with the products in our main review by making file-transfer and management procedures as simple as they would be on the local machine. Best of all, its Universal Communications Object (UCO) communications engine ensures that you do not need to know much about file-transfer, remote-control, or communications software to run it.

File management is all *LapLink Pro* knows, but it knows file management. You get the split screen familiar to previous *LapLink* users, with a consistent interface throughout the program's use. You also get batch-transfer, updating, and tagging abilities. The Synchronize option updates files to the most recent version, whether the file is on the host or the guest. And the program allows connection into a net-

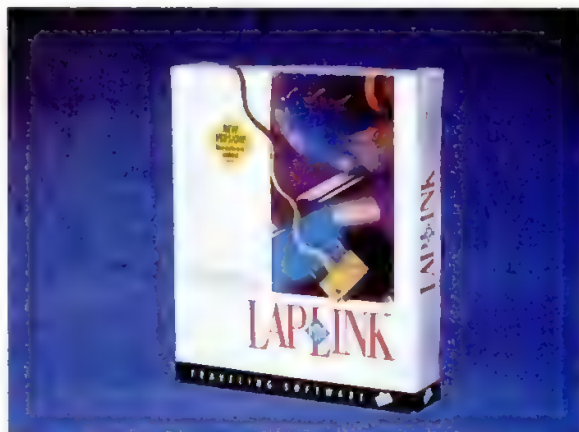
work: If the remote computer is attached to the network, so are you. Traveling Software wisely built in password-controlled access, though the company would have been still wiser to ensure that the password does not show on the screen. A curious passerby has no trouble going into the program and changing the access password.

File-transfer speeds are limited only by the speed of the modems, and *LapLink* has a proprietary data-compression protocol that keeps things moving along quickly. During transfer, a status gauge keeps you apprised of what percentage of the file has been transferred. In the case of multiple file transfers, the numeric percentage shows the transfer status of the individual file, while the gauge indicates the aggregate of the selected transferring files.

Simple file management—deleting, renaming, and creating directories and files—is also available. As with many of the programs in the main roundup, shelling out to DOS or other applications on the local machine is possible, but the program will hang up the modem. (It's nice to note that the disconnection process for *LapLink Pro* is fairly clear-cut; while several products in the main review gave false hang-ups or "no carrier" messages, we did not encounter this particular problem with *LapLink Pro*.) Of course, the host machine's applications and its peripherals remain unavailable to the guest, but even this is mitigated somewhat by *LapLink Editor*, a built-in text editor with such thoughtful extras as a large-type option for laptop users.

The Windows-style pull-down menus can be opened by keystroke or by mouse; since there is no need to control the remote mouse, the speed is just as it would be normally on the

local machine. While the program is DOS-based, it also comes with a Windows icon and setup for easy access. Installation is simple; UCO negotiates stop bits and parity for both the local and remote machine, thus ensuring that using modems to transfer files is no



LapLink Pro is intended only for file transfer and a little housekeeping of your hard disk, but its pull-down menus and powerful utilities make those tasks simple and speedy.

more complicated than using the parallel or serial cables of yore.

If your needs are beyond the range of this product—if you require control of the remote machine's applications, rather than just its files—by all means go for the full modem remote-control packages reviewed in the main article. But if your tasks or your equipment are a bit less sophisticated, *LapLink Pro*'s simple fast transfers and updates will make you happy. Its many thoughtfully chosen features make *LapLink Pro* useful for remote computing duties. And *LapLink Pro* provides the bonus of use as a traditional laptop-to-PC file-transfer package—that is, if you ever bother to bring your laptop into the office again. ■

LapLink Pro, Version 4.0

Traveling Software Inc., 18702 North Creek Pkwy., Bothell, WA 98011; 800-343-8080, 206-483-8088.

List Price: \$169.95 (includes parallel and serial cables).

Requires: 440K RAM, DOS 2.11 or later, Hayes-compatible modem.

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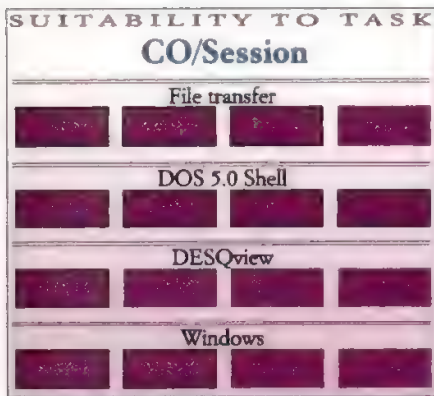
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COMMUNICATIONS REMOTE-CONTROL SOFTWARE



Windows remotely as handily as if we ran it on a standalone PC. And *CO/Session* did as well in Enhanced mode as in Real and Standard modes. The Intelligent Graphics technique, however, works only with Windows. *CO/Session* monitors video memory on the host, as other programs do, to update graphical screens in DOS products such as *Microsoft Word*.

TIMELY TRANSFERS

Triton's file-transfer protocol uses a Sliding Windows protocol and proprietary data compression. It delivered our uncompressed 150K test file in 1 minute 21

You can enable security options like individual user passwords in *CO/Session*'s phonebook entries.



seconds, but it was bested in this round by *Close-Up*, *Carbon Copy Plus*, *ReachOut*, and *BLAST Professional DOS*.

Unlike *Close-Up*, which is able to detect previously compressed files automatically and turn off compression to speed the transfer, *CO/Session* leaves the user to perform the feat manually. But *CO/Ses-*

sion graces users with an easy-to-use, *XTree*-like Files menu that makes the file-transfer process and other file-handling chores a snap. The Files menu alphabetically displays all files in the host's and guest's active directories and allows easy navigation to other directories. Users can transfer files or copy, move, or delete

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COMMUNICATIONS
REMOTE-CONTROL SOFTWARE

them locally simply by highlighting one or more filenames.

If it detects files of the same name are present elsewhere, *CO/Session* asks you to confirm before overwriting them. The overwrite warning, however, can be turned off if you are performing unattended transfers. Or you can have the program automatically overwrite out-of-date files.

SPEEDY SETUP

Installation is easy. *CO/Session*'s manual includes a three-paragraph section called "If you do not like to read manuals. . ." that simply says to follow instructions in the pop-up menus and refer to the "modem and cables" or "troubleshooting" sections if you encounter problems. That's about all we had to do.

CO/Session even eases modem setup with its laundry list of compatible modems. Installing the program for your modem is as easy as choosing a name from a list. A call to technical support will confirm which selection is compatible with your modem, and Triton technicians will even custom-write modem initialization strings if none of the offerings does the trick; all you have to do is fax them the

command summary from your modem's documentation.

CO/Session's default options will work fine for making simple connections between individual PCs. When corporate security is of particular concern, however, you can use several security options not found in most competing programs. In addition to measures such as dialback and individual user passwords, *CO/Session* allows a systems manager to restrict access to certain drives and directories on a user-by-user basis, to restrict rights to upload or download files, or to control users' access and operations by having *CO/Session* execute batch files when particular passwords log in.

CO/Session is respectful of RAM except when running Windows. On the host side, you can load the program as a TSR in as little as 56K, and a special utility called XAPPLICA.EXE can load the program into expanded memory, leaving only 5K in conventional RAM. On the guest side, however, available memory shrinks to 64K when the RWIN program is loaded to run Windows remotely. RWIN consumes

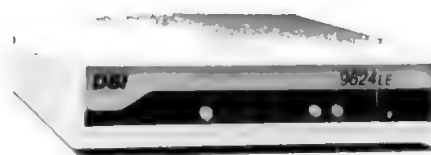
the rest, no matter how much memory you have installed, to facilitate communication among the drivers and buffer screen information to achieve lightning-fast updates. (Since it's the host that does the work, this should be no problem.) If you plan to run only DOS applications remotely, you can choose not to load RWIN and use only 123K on the guest side.

COOL OPERATOR

With *CO/Session*'s Special Keyboard Handling option enabled, the program can relay scan codes for macros and other key-combination operations. It recognized DOS 5.0's Alt-Tab key combination for task-switching through the DOS Shell, as well as the Alt key that opens Windows in *DESQview*. And it allowed us to maneuver through menus in both programs using the Tab and arrow keys, and the mouse.

Triton Technologies offers free support at a toll number, as well as a BBS. With its unique intelligent graphics approach to Windows operations, efficient compression schemes, friendly *XTree*-like file menu, and attention to security needs, *CO/Session* should be at the top of any corporate buyer's chart.

The Original V.32bis and Fax Modem



The Original

That's right, Digicom Systems, Inc. was the first modem manufacturer to introduce V.32bis and CCITT Group 3 send and receive fax capabilities in the same modem.

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The 9624LE Plus operates at 14,400 bps true full duplex, which is 50% faster than V.32 modems and 6 times faster than 2400 bps modems. Effective throughputs of



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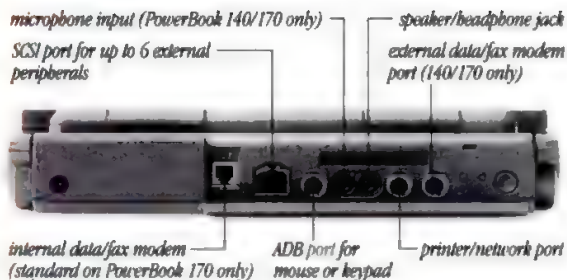


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170	6.8 lb.	4MB	40MB	Internal	25 MHz 68030/ 68882 coprocessor	Standard

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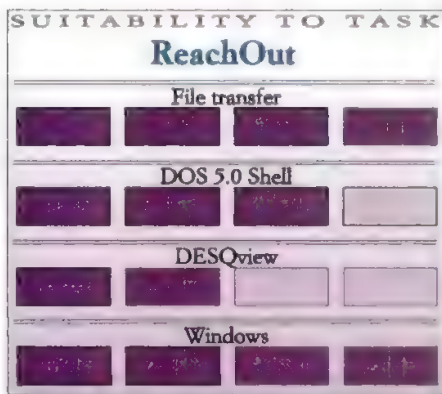
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ReachOut

by Wendy Dugas Pérez

If you need to cross the gulf that sometimes separates you from your office PC, *ReachOut*, from Ocean Isle Software, can be the right product to get you under way. At \$195 for both the guest and host software, this remote-control product can be set up as either a DOS or Windows 3.0



application on the host PC, while working under DOS on the guest. Although *ReachOut* lacks some functionality and could support DOS applications better, its file-transfer capabilities stand out, and it shines within the Windows environment.

ReachOut includes a full-featured file manager that is useful not just for transferring files, but for disk management as well. The file manager provides a split screen—one side showing the source PC's directory structure, the other side the target PC's. Transferring files is as easy as tagging a file and copying it to the target. The product's proprietary compression

algorithm proved very quick on our file-transfer test.

While *ReachOut* supplies most features that a good remote-control package should have, including dialback, reboot on hang-up, support of high-speed modems, print capabilities, and a chat mode, it lacks guest mouse support in DOS applications and logging capabilities. Version 2.0 also does not provide many security features or the ability to redirect printing, but print redirection and more extensive security features have been included in the new version of the product, which arrived too late for complete testing.

NOT STUMPED BY WINDOWS

Many products were stumped by our Windows testing, but *ReachOut* passed easily. We only had to slow down the mouse speed all the way to achieve full Windows functionality at close to real-time speed. (We verified that this minor mouse glitch has been corrected in *ReachOut*'s new version.) Printing via Windows, and establishing a LAN connection from our host PC during a modem connection, worked as well.

The DOS Shell and *DESQview* tests proved a stumbling block for the package, though. While *ReachOut* could load the DOS Shell and open applications, colors appeared slightly off in *Lotus 1-2-3*, and the guest PC had no mouse control over the DOS Shell. Toggling among applications had to be done from the host keyboard, and we could only switch from *WordPerfect* to the DOS Shell in the active program list. *ReachOut* did not



ReachOut, Version 2.0

Ocean Isle Software, 80 Royal Palm Blvd., Vero Beach, FL 32960; 407-770-4777.

List Price: Host and guest, \$195.

Requires: Host: 9K (for Windows use only) to 42K (for DOS and Windows use) RAM, DOS 2.1 or later. Mouse recommended. Guest: 321K RAM, DOS 2.1 or later. Mouse recommended.

In Short: *ReachOut*'s host can run as a Windows 3.0 application and the product gets high marks for controlling Windows across a modem line—with virtually no time difference in screen updates. More attention is needed to support of DOS applications, but fast file-transfer speeds and a great file manager make this package easy to recommend.

CIRCLE 485 ON READER SERVICE CARD

recognize that *1-2-3* was active unless we specifically selected it. (The *1-2-3* color problem has been fixed in the new version.)

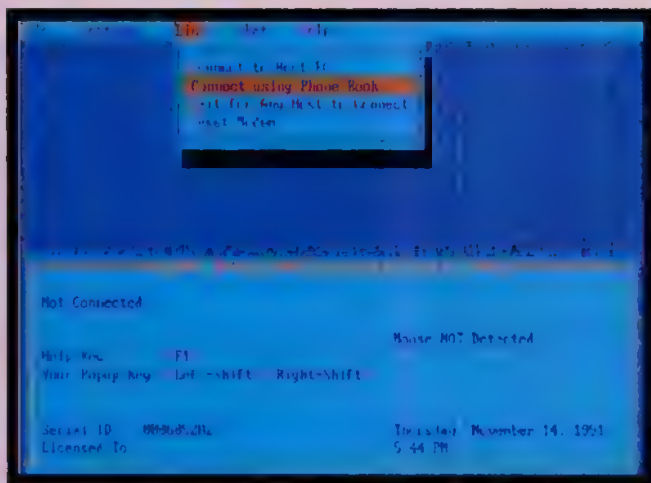
In the version we tested, *ReachOut* had no mouse support from within *DESQview* either, but we could load *DESQview* and several applications from the guest keyboard. The package failed to handle split screens, however: Whenever we opened more than one application, the guest screen would turn gray until we exited out of one of the programs, leaving a single screen. The guest PC still retained keyboard functionality, as all keystrokes from the guest and host PC were reflected on the host's monitor.

THOUGHTFUL CUSTOMER SUPPORT

The software includes good, detailed, context-sensitive help, and Ocean Isle provides free technical support from 8:00 A.M. to 6:00 P.M. E.S.T. at a toll number. This may leave some of you on the West Coast without help in the afternoon hours, but you can call up the company's BBS 24 hours a day at 407-778-2407.

A particularly thoughtful customer support option within both the host and guest menu structure lists the technical support number, the version of the software you are using, the version of DOS you are running, your CPU type, your base memory, and your monitor type. The

ReachOut lacks guest mouse support in DOS applications, as shown here by its status screen. Menu selections let you decide whether the program will initiate a connection or wait for calls.



COMMUNICATIONS

REMOTE-CONTROL SOFTWARE



MODEM REMOTE-CONTROL SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

Editors' Choice
☒—Yes ☐—No

	BLAST Professional DOS	Carbon Copy Plus	Central Point Commute	Close-Up
List price	\$295	\$199	\$129	\$199
Host only	\$99	\$119	N/A*	N/A*
Guest only	N/A*	\$119	N/A*	N/A*
LAN version available	☒	☒	☒	☒
MEMORY AND DISK STORAGE REQUIREMENTS				
Host application	85K	60K	510K	34K–80K
TSR portion	85K	60K	15K–60K	34K–80K
Guest application	400K	190K	460K	153K
TSR portion	400K	190K	15K–60K	N/A**
EXTENDED/EXPANDED MEMORY				
Can load host into extended or expanded RAM	☐	☐	☒	☒
Can load guest into extended or expanded RAM	☐	☐	☒	☐
Can remove TSRs without rebooting	☒	☐	☒	☐
Has built-in memory manager	☐	☐	☒	☐
Supports QEMM and 386MAX	☒	☒	☒	☒
INTERFACE				
Command-driven	☒	☒	☒	☒
Menu-driven	☒	☒	☒	☒
DOS character-based	☒	☒	☒	☒
Microsoft Windows 3.0	N/A***	☒ (with LAN only)	☐	☐
FILE TRANSFER				
Works in foreground	☒	☒	☒	☒
Works in background	☒	☒	☐	☒
Compresses files	☒	☒	☒	☒
Offers simultaneous bidirectional transfer	☒	☐	☒	☐
Can transfer by batch	☒	☒	☒	☒
Can tag multiple files	☒	☐	☐	☐
Will prompt before overwriting	☒	☐	☒	☐
Offers delete/copy/move operations	☒	☒	☐	☐
Can turn off error checking	☒	☒	☐	☒
Includes protocols:				
Xmodem	☒	☒	☐	☒
Ymodem	☒	☐	☐	☐
Zmodem	☒	☐	☐	☐
Kermit	☒	☐	☐	☐
Other	Proprietary	Ymodem batch	Proprietary	Proprietary
SECURITY				
Can reboot host on hang-up	☒	☒	☐	☒
Can log off after inactive period	☒	☒	☒	☒
Master password available for system manager use	☒	☒	☐	☒
Uses separate password to change setup	☒	☐	☐	☒
Access restrictions:				
By drive	☐	☐	☐	☐
By directory	☐	☒ (during transfer only)	☐	☐
By file	☐	☐	☐	☐
VIDEO				
Keystroke updates	☒	☒	☐	☒
Timed updates	☐	☒	☒	☒
Graphical updates:				
Full-screen bitmap	☐	☐	☐	☐
Changes only	☒	☒	☒	☒
Offers guest viewing of host	☒	☒	☒	☒ (if guest has an equivalent monitor or better)

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4195	☐ Photostyler 1 0	549
Application Techniques ... NCP		
1214	☐ Pizazz Plus 2.0	69.
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2455	Lantastic EtherNet Starter Kit (includes software, 2 EtherNet cards, cable)	495.
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Atech Software ... NCP		
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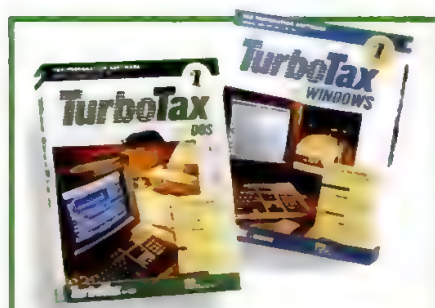
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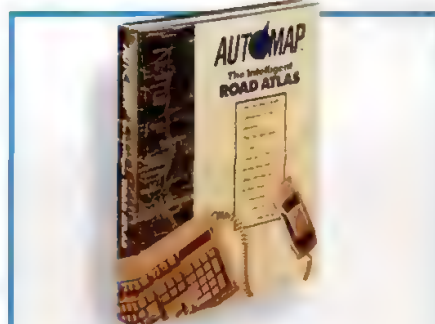
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9627	▣ Netroom 2.1 (single user)	65.
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2666	▣ DOS 5.0 Upgrade	59.
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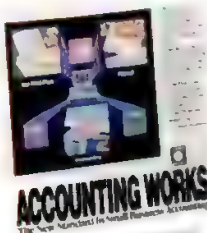


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- 8378 ☐ PC Anywhere IV 4.03 125.

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- 4388 ☐ SimAnt from Maxis 39.
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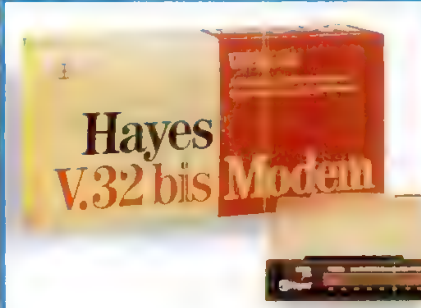
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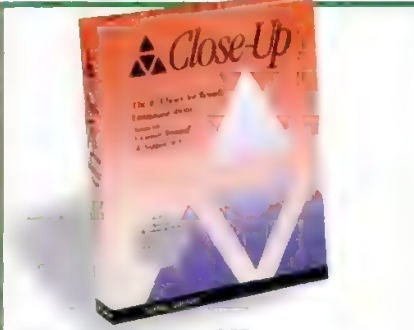


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7012 Memory Upgrade PS/2 70 - 2 MB 139.



Norton-Lambert ... NCP
2755 Close Up for Windows & DOS Data Pack 4-2—New! View and operate PCs miles away via modem. Give instant Windows and DOS support to customers at any location. VGA/EGA. intro. price till March 31 \$129.

Microsoft ... lifetime
7597 Microsoft Mouse (bus or serial) 89.
2897 Mouse with Paintbrush (bus or serial) 105.
2898 Mouse with Windows 3.0 (bus or serial) 149.
1956 Mouse with Works (bus or serial) 155.
1896 Ballpoint Mouse (serial only) 119.
MicroSpeed ... 1 year
2763 MicroTRAC (serial & PS/2 interface) 59.
PC-TRAC Trackball
serial 75. 6008 bus 89.
7271 Inport 79. 6330 PS/2 79.
Mouse Systems ... lifetime
5997 Trackball (1 yr. wnty.) serial 65. bus 69.
3213 PC Trackball II (serial) 69.
7878 PC Mouse III (serial) 89. (bus) 95.

1-800/800-0004
MMC **PC Connection** **930M**
6 Mill Street
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Okidata ... 1 year
5094 OL830 Page Printer—PC Magazine Editors' Choice. "...the best PostScript printer for cost-conscious buyers." (11/26/91). 8 ppm, 17 scalable fonts, 2 MB memory, free auto-emulation switching software, w/Mac option ... \$1329.

NEC ... 2 years
9441 CDR36 Portable CD-ROM Drive 399.
4252 Multisync 3FGX Monitor (14") 679.
4249 Multisync 4FG Monitor (15") 779.
Okidata ... 1 year
5093 OL400 Page Printer (4 ppm) 649.
5094 OL830 Page Printer (8 ppm) 1329.
3025 Toner Cartridge 25.
Orchid Technology ... 4 years
7863 ProDesigner VGA IIS (with 1 MB, includes RAMDAC chip) 249.
4071 1280i with 1 MB 365.
Pacific Data Products ... lifetime
6779 25 Cartridges in One! (LJ II, IID, IIP, III, IIID) 269.
Fontbank (for LJ II, IID, IIP, III, IIID, IIIP) (0.75 MB) 225. 3491 (1.5 MB) 299.
8975 Complete Font Library (LJ III, IIID, IIIP) 275.
Memory upgrade for LJ IIP, III, IIID, IIIP:
2 MB 145. 7759 4 MB 259.
Memory upgrade for LaserJet III/IIID:
2 MB 249. 6836 4 MB 369.
8090 Pacific Connect with 1.25 MB 349.
7158 Pacific Page PE (LJ IID, IIP, III, IIID, IIIP) 379.
6834 Pacific Page (for LJ II) w/2 MB Mem. Brd. 379.
9833 Pacific Page XL (w/accelerator board) 799.



Intel ... NCP
Matched Memory for Compaq LTE—Upgrade your Compaq LTE386s/20 or LTE/286 with reliable, high-quality Matched Memory from Intel. 1M, 2M (LTE/286 only), and 4M modules available. see line listings.

800/800-0004

PC Power & Cooling ... 1 year REPLACEMENT POWER SUPPLIES

3203	Turbo Cool 200	\$149.
7915	Turbo Cool 300 (2 yr. warranty)	159.

Practical Peripherals ... 5 years

3103	2400 Baud Internal Modem	85.
3102	2400 Baud External Modem	179.
8993	2400 Baud Internal Modem (V.42 bis) ..	169.
8994	2400 Baud External Modem (V.42 bis) ..	199.
4542	2400 Baud Internal Modem for PS/2 ..	229.
8132	PM2400 Pocket Modem	109.
2266	PM9600 Internal Modem	399.
7934	PM9600SA Modem	469.
2264	PM2400FX96 (modem/fax board)	145.

Targus ... lifetime

1305	Universal Notebook (for ntbk. computers) ..	69.
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TheComplete PC ... 2 years

8082	Half Page Scanner/400 w/ReadRight ..	289.
5828	TheComplete Communicator	319.
4316	TheComplete Fax Portable Plus	319.

Toshiba ... 1 year

3361	T2000SX Notebook (60 MB)	2949.
4137	T2200SX Notebook (60 MB)	3349.
1773	T3200SX Laptop (120 MB)	3249.

Tripp Lite ... 2 years

6199	Isobar 4-6 (4 outlets, Gold Seal Warranty) ..	49.
6200	Isobar 6-6 (6 outlets, Gold Seal Warranty) ..	59.
6201	Isobar 8-12 (8 outlets, Gold Seal Warranty) ..	69.

Video 7 ... 7 years

9768	VRAM II VGA 1 MB	329.
------	------------------------	------

Zoom Telephonics ... 7 years

1307	Int. 2400 Baud w/9600 Baud Fax Modem ..	109.
1178	Ext. 2400 Baud w/9600 Baud Fax Modem ..	119.
1181	2400 Baud V.42bis Modem (2 year)	129.
1167	2400 Baud Internal Modem	65.
1166	2400 Baud External Modem	75.
3075	9600 V.32 Turbo Internal Modem (2 yr.) ..	399.
1494	9600 V.32 Turbo External Modem (2 yr.) ..	399.



AddStor ... NCP

4090 SuperStor 1.3—Increase your disk space 2-3 times and compress data on floppies and external media. Easy installation and use, with no artificial DOS commands. Completely data safe and transparent \$83.

Quantum ... 2 years

8304	Plus Hardcard II XL 50 MB (9 ms)	\$299.
8287	Plus Hardcard II XL 105 MB (9 ms)	449.
4060	105 MB Drive Kit for MC PS/2's (13 ms) ..	789.
4009	105 MB IDE Drive Kit (13 ms)	399.
4061	210 MB IDE Drive Kit (13 ms)	749.
4059	80 MB Drive Kit for MC PS/2's (13 ms) ..	629.

TEAC ... 1 year

4670	1.44 MB Drive for PC/XT (3 1/2")	69.
4326	1.44 MB Drive for AT (3 1/2", w/Basetech) ..	89.
4951	720k Drive for PC/XT (3 1/2")	69.
6951	1.2 MB Drive for AT (5 1/4")	75.

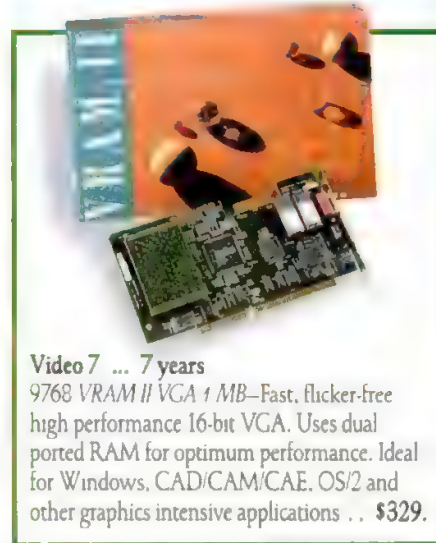
MEMORY

6556	256k DRAM (100 ns, set of 9)	call
5510	1 MB x 9 SIMMs (80 nanosecond)	call
2497	4 MB x 9 SIMMs (80 nanosecond)	call
5746	1 MB Chips (80 ns, set of 9)	call
7813	256K x 4 Chips	call



Canon ... 1 year

7894 BJ-10ex Printer—New enhanced version of the popular 4.6 lb. printer provides laser-like print quality (up to 360 dpi) on plain bond paper, envelopes or transparencies. Available in white or gray \$339.



Video 7 ... 7 years

9768 VRAM II VGA 1 MB—Fast, flicker-free high performance 16-bit VGA. Uses dual ported RAM for optimum performance. Ideal for Windows, CAD/CAM/CAE, OS/2 and other graphics intensive applications .. \$329.

DISKS/MEDIA

Fuji ... lifetime

2215	3 1/2" HD Disks (10)	15.
2239	3 1/2" HD Disks Color (Qty. 10)	69.
2214	3 1/2" DS Disks (10)	9.
2243	3 1/2" DS Disks Color (Qty. 10)	10.

Sony ... lifetime

3291	5 1/4" DS/DD 360k Disks (Qty. 10)	7.
3292	5 1/4" HD Disks (Qty. 10)	12.
3297	3 1/2" DS Disks (10)	9.

3298	3 1/2" HD Disks (10) ..	\$15.
6375	(30) ..	\$42.
1603	DG60M 4mm Data Cartridge (1.3 GB) ..	16.
2520	DG90M 4mm Data Cartridge (2 GB) ..	27.
8185	QD2040 Tape Cartridge	14.
1895	QD2120 Tape Cartridge	21.
6715	QD6150 Tape Cartridge	23.
1609	QG112M 8mm Data Cartridge (5 GB) ..	15.
3M ... lifetime		
3943	DC2000 Tape Cartridge	18.

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Practical Peripherals ... 5 years

2264 PM2400FX96 Fax Modem—2400 bps internal modem with true 9600 bps send/receive capabilities. A Hayes compatible 1/2 card, it also allows you to receive faxes in the background, & includes QuickLink II. . \$145.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

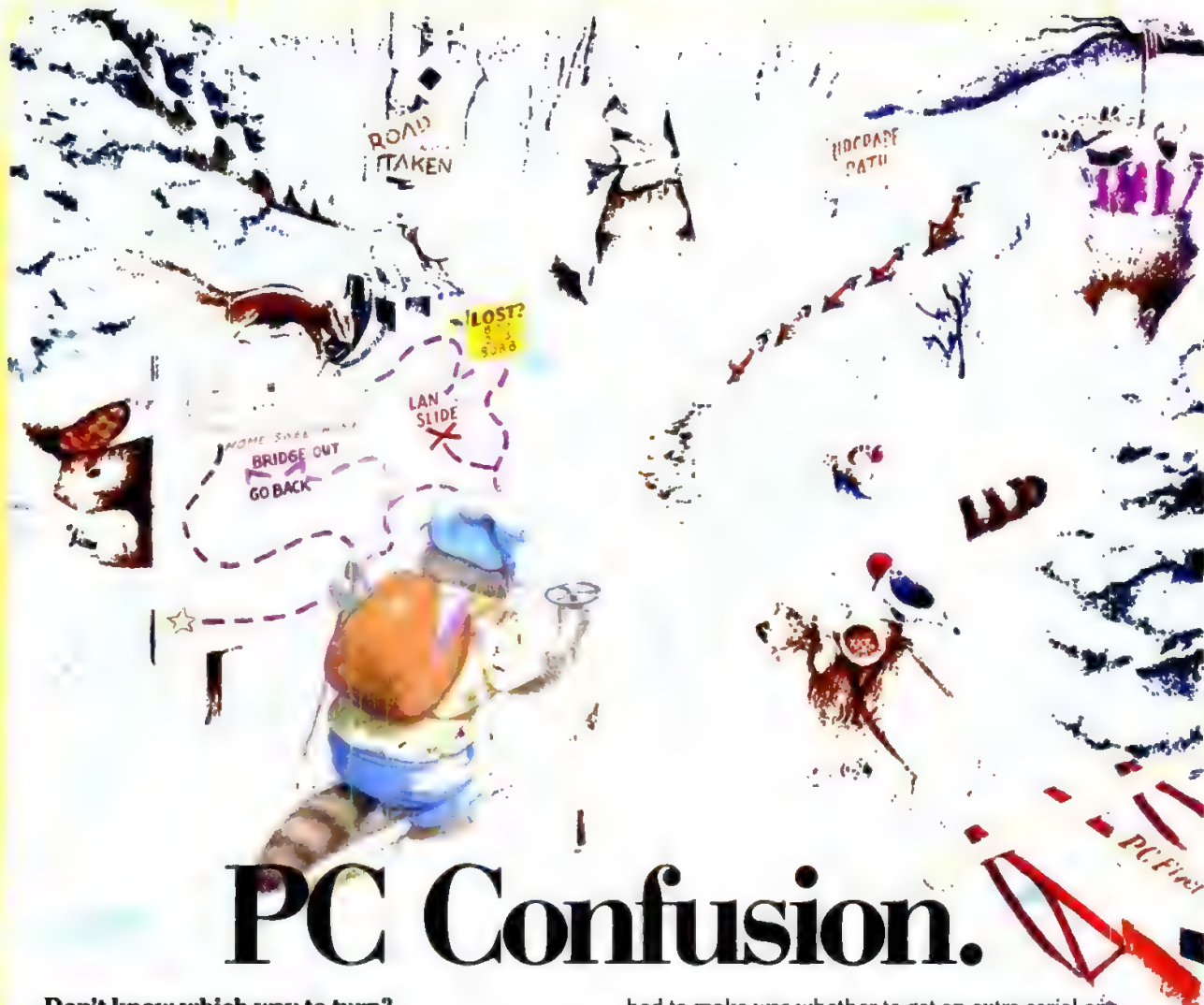
- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

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- Call 603/446-7721 for information.



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COMMUNICATIONS

REMOTE-CONTROL SOFTWARE

Remote² allows you to choose among several security options in its configuration menus. Here you can set the callback option, file-transfer rights, passwords, and system manager rights.



\$195 for the guest and host, \$129 for the host alone, and \$89 for the guest alone—well in line with the other packages reviewed here. While *Remote²* does not outright fail in any particular area, its previous Editors' Choice (reported in "Modem Remote-Control Software: The Next Best Thing to Being There," June 12, 1990) is not merited in this latest software roundup, since the program has

not kept pace with its competition.

Although DCA does not claim Windows support, we were able to get *Remote²* to work with Windows across the remote-control link. But attempting this could test anyone's sanity. Screen updates were so slow that you could start Windows and then leave your desk, since you wouldn't be doing anything for the next few minutes anyway. The package

had no guest mouse support at all and keyboard support only in Real mode, not in Standard or 386 Enhanced modes. Shelling out to DOS from Windows caused real problems: The guest PC's screen showed strange characters and then would not allow us back into Windows. The package was, however, able to print a file from within Windows.

DOS SHELL AND DESQVIEW PROBLEMS

The DOS 5.0 Shell and *DESQview* testing presented problems as well. DCA does not claim mouse support in these environments, and we confirmed that we could not use the mouse on the guest PC. We were able to load the DOS Shell and maneuver using the keyboard, but both *Lotus 1-2-3* and *WordPerfect* failed to load, with the guest PC flashing and the host PC locking up during the loading of *WordPerfect*. With *DESQview*, we were again able to load the environment, but the product failed to execute either *1-2-3* or *WordPerfect*.

As with the other programs we tested, we could log on to a network over a modem remote-control connection without a problem. But *Remote²*'s file-transfer times over a modem connection will not win any awards. The program transferred

MODEM REMOTE-CONTROL SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

— Editors' Choice ■—Yes □—No

MICROSOFT WINDOWS MODES SUPPORTED

	BLAST Professional DOS	Carbon Copy Plus	Central Point Commute	Close-Up
Real	N/A***	■ (with LAN only)	■	■
Standard	N/A***	■ (with LAN only)	■	■
386 Enhanced	N/A***	■ (with LAN only)	■	■

MODEM

Throughput range	300 bps–115.2 Kbps	1,200 bps–19.2 Kbps	1,200 bps–115.2 Kbps	1,200 bps–115.2 Kbps
Utilizes 16550A UART chip	■	■	■	■
Prints at guest and host	■	■	■	■

INPUT

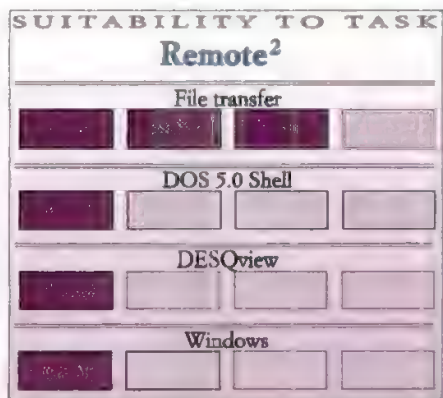
Guest supports DOS mouse use	■	□ (with LAN only)	■	■
Guest supports Microsoft Windows mouse use	N/A***	■ (with LAN only)	■	■
Relays audio signals	□	■	□	■
Host usage log available on-line	■	■	■	■
Guest usage log available on-line	■	■	■	■
Host notified of guest's call	□	■	■	■
Script language	■	□	■	■
Virus protection	□	□	■	■
Text editor	■	□	□	□

TERMINAL EMULATIONS

ANSI	■	□	□	□
Data General D210	■	□	□	□
DEC VT-100	■	■	□	□
IBM 3101	■	■	□	□

N/A***—Not applicable: This product does not support Microsoft Windows.

COMMUNICATIONS REMOTE-CONTROL SOFTWARE



our uncompressed 153,600-byte text file in 118 seconds over a 19,200-bps connection, the slowest among the products reviewed. Nevertheless, *Remote2* offers proprietary file compression and its file-transfer interface was good, providing information on the status of the file transfer. You can automate file transfers with batch commands, use wildcard characters, and tag multiple files for transfer.

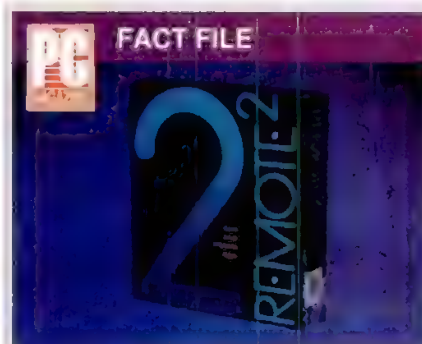
MORE MEMORY FOR EXTRA SECURITY

Remote2 uses 127K on the guest side. The host side loads as a TSR and takes up 51K. You can load two additional TSRs, Chat and Guard, if you need them. Chat uses

only 21K; Guard, *Remote2*'s security feature, uses slightly over 10K, depending on the number of security configurations you have enabled. With the Guard TSR loaded, you can restrict access to drives, directories, and files. You can also specify whether each user has read, write, open, create, delete, filename search, and/or modify rights.

Other *Remote2* features include dial-back, which allows you to dial in to your office PC and then have it call you back, thus sparing your home phone bill. The package also lets you easily disable the host's screen and keyboard for better security. Printing can occur at either the host or the guest, or be redirected to either, but you cannot print at both. No script language or keystroke playback capability is included, although the program does offer logging functions, a voice switch, and account-tracking features.

DCA provides technical support via a toll call from 8:30 A.M. to 8:00 P.M. E.S.T., giving ample coverage for users on both the East and West Coasts. A BBS is available as well. DCA's family of products includes *R2LAN2*, a network remote-control product for use with



Remote2, Version 2.1.0

Digital Communications Associates, 1000 Alderman Dr., Alpharetta, GA 30202-4199; 800-348-3221, 404-442-4000.

List Price: Host only, \$129. Guest only, \$89. Host and guest, \$195.

Requires: Host: 128K RAM, DOS 2.0 or later. Guest: 64K RAM, DOS 2.0 or later.

In Short: With its slow file-transfer times and poor Windows and DESQview support, *Remote2* just doesn't make the cut when compared with its competition. Though *Remote2* is serviceable for basic remote-control functions, there are more full-featured products out there at equal or lower costs.

CIRCLE 486 ON READER SERVICE CARD

NetBIOS-compatible LANs.

Without faster screen updates in Windows as well as better DOS applications support, *Remote2*'s performance does not warrant a recommendation for these uses. Unless you are only looking for file transfer—and even then you can find a faster product—you are better off looking elsewhere.

Takeover Lite

by Wendy Dugas Pérez

It seems as if every product on the market today has a "lite" version, whether beer or mayonnaise. SoftKlone Corp. has taken this marketing trend to heart with *Takeover Lite*, Version 2.0. By offering all of the modem remote-control features of the \$295 *Takeover* but only an entry-level form of the *Mirror III* communications program, SoftKlone has slimmed down *Takeover Lite*'s asking price to \$179 and put it more in line with its competition. *Takeover*'s combination of features merited an Editors' Choice the last time we reviewed these products (reported in "Modem Remote-Control Software: The Next Best Thing to Being There," June 12, 1990). But due to its lack of support for today's more advanced programs, particularly Windows 3.0, *Takeover Lite*

CO/Session	ReachOut	Remote2	Takeover Lite
■	■	■	N/A**
■	■	■	N/A**
■	■	■	N/A**
1,200 bps-19.2 Kbps	1,200 bps-38.4 Kbps	1,200 bps-38.4 Kbps	1,200 bps-19.2 Kbps
□	■	■	■
■	■	□	■
■	■	■	■
■	■	■	■
■	■	■	■
■	■	■	■
■	■	■	■
\$95	■	■	■
□	■	□	■
□	■	□	■
□	■	■	■
□	■	■	■
□	■	■	■
□	■	■	■

ENDS

TWO REMOTE-CONTROL COMPETITORS ADD WINDOWS FUNCTIONALITY

by Michael Cohn

Many modem remote-control vendors have made a high priority of adding Windows support. When Microsoft released Microsoft Windows 3.0, few companies dared claim the ability to run its complex graphical user interface over a remote modem connection. However, the program's growing popularity has made Windows support an increasingly trumpeted feature.

Nevertheless, two companies were still preparing their remote-control products for the Windows market during our testing phase: Microcom and Symantec/Peter Norton Group. We were able to try out prerelease copies of their latest programs, *Carbon Copy for Windows*, Version 1.0, and *Norton pcAnywhere*, Version 4.5, respectively, and see how well they handle the Windows juggernaut.

At press time, Microcom planned to sell *Carbon Copy for Windows* for \$199, the same price as *Carbon Copy Plus*, its DOS-based program reviewed in our main feature. Symantec/Peter Norton expected to match the price of *Norton pcAnywhere*, Version 4.5, with that of the previous version of the

program: \$179 for the modem remote-control version and \$495 for the LAN remote-control product.

CARBON COPY FOR WINDOWS: MAKING A GUI APP

Microcom's *Carbon Copy for Windows* is a genuine Windows application in its own right. The product takes advantage of the Windows interface to provide a cheerful opening menu with cartoon-like push buttons to indicate options such as Chat and Password Table. It also adds the mouse support lacking in *Carbon Copy Plus*'s modem remote-control program. Installation is easy, but the program modifies your SYSTEM.INI file and copies its own sound, keyboard, mouse, and display drivers to your Windows system directory.

The remote-control portion of the program did an excellent job controlling and multitasking Windows applications such as *Lotus 1-2-3 for Windows* and *Microsoft Word for Windows* without a struggle. Over a 19,200-bps connection response time was crisp, and the program translated mouse movements perfectly. *Carbon Copy*

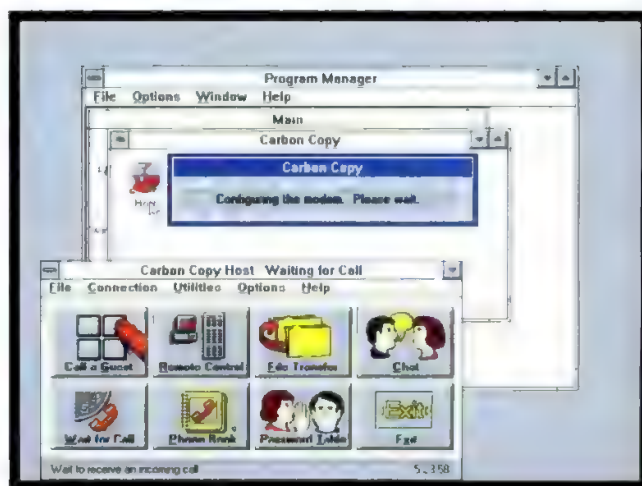
for Windows also demonstrated excellent throughput during file transfer, rivaling the best of the products in our main reviews.

You cannot use the file-transfer module while *Carbon Copy for Windows*' remote-control utility is active, but exiting from one and switching to the other takes only a few keystrokes. The file-transfer module is a big improvement over the command-line interface used in *Carbon Copy Plus*. After you select the file-transfer push button, the program divides the screen into four parts: directory trees for the host and remote drives in the top two quarters and the files in the currently selected directories in the bottom two quarters. This interface, which resembles Windows' File Manager, makes it easy to tag groups of files for transfer. You can also mark files for deletions.

Probably the biggest drawback of *Carbon Copy for Windows* is its inability to run full-screen DOS applications. If you want to control a DOS program remotely, you need to run Windows in 386 Enhanced mode and execute the program in a DOS win-



The new version of *Norton pcAnywhere* includes Zmodem protocol for transferring files. This setup screen shows how you can set compression and other options for the program's AWSEND proprietary protocol.



The main menu for the host side of *Carbon Copy for Windows* features a series of cartoon-like push buttons that illustrate the program's main options.

dow. Since Microcom is not bundling *Carbon Copy for Windows* with *Carbon Copy Plus*, this may leave you in a quandary about which package to choose. The *Carbon Copy for Windows* package also does not include the terminal emulation and LAN remote-control capabilities contained in *Carbon Copy Plus* (although an included coupon for MicroCourier will get you the former).

PCANYWHERE 4.5: CLASSIC LOOK WITH NEW FEATURES

Symantec/Peter Norton's *Norton pcAnywhere*, Version 4.5, is also acquiring Windows' remote-control capability, but without undergoing a face-lift or becoming a Windows GUI application. The new version of *pcAnywhere* retains its *NetWare*-style menu interface, which keeps the program integrated with the look-and-feel of its network remote-control counterpart, *Norton pcAnywhere 4.5 LAN*. The menus include a large range of diagnostic features.

The prerelease version we tested ran Windows and Windows applications smoothly over a 19,200-bps connection and did a good job moving the mouse cursor. The screens and colors were identical on both the host and guest sides. The program also produced impressive times on our file transfers, especially when transmitting an uncompressed text file. Installation was easy, but like *Carbon Copy for Windows*, *pcAnywhere* modified the *SYSTEM.INI* file and substituted various drivers.

Aside from the move to Windows support, the new *pcAnywhere* gives more attention to accessing hosts beyond fellow *pcAnywhere* machines. Whereas users of earlier versions had to make do with DEC VT220 terminal emulation and Xmodem protocol when calling non-*pcAnywhere* systems, the new version offers nine file transfer protocols, including Ymodem, Zmo-

dem, and Kermit, and 17 terminal emulations. *Norton pcAnywhere*, Version 4.5, also features a script language for users who want automatic access to these outside services.

In short, modem remote-control vendors are rapidly catching up to Windows support. And with the increased support for graphics from these programs, users have less reason to pack all their office PC's programs onto their laptop hard disks. ■

Carbon Copy for Windows, Version 1.0

Microcom Inc., 500 River Ridge Dr., Norwood, MA 02062; 800-822-8224, 617-551-1000.

List Price: Host and guest, \$199.

Requires: 286-based PC or better, 1MB RAM, graphics card, DOS 3.1 or later, Microsoft Windows 3.0. Mouse recommended.

In Short: The latest version of *Carbon Copy* adds an attractive graphical interface to a venerable DOS-based application. Besides adding Windows support, *Carbon Copy for Windows* supports mice and offers more flexible file-transfer features. It can only run DOS applications in a DOS window, however, rather than full-screen.

CIRCLE 490 ON READER SERVICE CARD

Norton pcAnywhere, Version 4.5

Symantec/Peter Norton Group, 10201 Torre Ave., Cupertino, CA 95014; 800-441-7234, 408-253-9600.

List Price: Host only, \$99. Guest only, \$129. Host and guest, \$179.

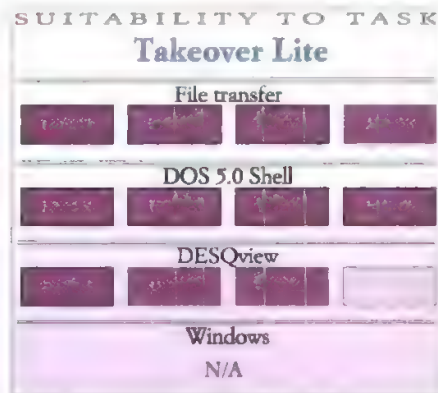
Requires: Host: 64K RAM, DOS 3.1 or later, Windows 3.0 or later. Mouse recommended. Guest: 320K RAM, DOS 3.1 or later. Mouse recommended.

In Short: The new *Norton pcAnywhere* 4.5 adds Windows support, more terminal emulations, file-transfer protocols, and a scripting language to make a speedy and reliable product even more versatile.

CIRCLE 491 ON READER SERVICE CARD

doesn't fare as well against this year's competitors.

Because of its relatively late entry into the market—the product is 2 years old—SoftKlone has been very aggressive in its site license pricing. For ordering only 25 copies, you get a 50 percent price cut, down to only \$89.50 for both the host and



guest software. If you purchase 25 copies of the guest or the host separately, their normal \$99 price drops to a multiple-copy price of \$49.50. Further discounts are available, depending on your needs.

Memory requirements will not surprise you. The guest application requires 480K of available RAM and the host TSR takes from 48K to 73K, depending on the configuration. The TSR can take advantage of extended or expanded memory. While the host software uses up only 300K of hard disk space, the guest requires 1.3MB.

PULL-DOWN MENUS

Takeover Lite offers an easy-to-use interface, with Windows-like pull-down menus. But its slightly different conventions can prove frustrating if you use Windows regularly. For example, you only need to press the first letter of a menu option, and not Alt and that letter, as in Windows. But that only brings you to the proper place in the menu; you cannot execute the command until you hit the Return key or click the mouse.

Takeover Lite includes features found in most modem remote-control packages, including dialback, chat mode, and a phone book. You can choose to print output at the host PC, guest PC, or both. Features not as common, although often invaluable, include a file manager, guest mouse support for DOS applications, and recording of sessions for later playback. Session logging capabilities are missing, although you can expect them in the next version.



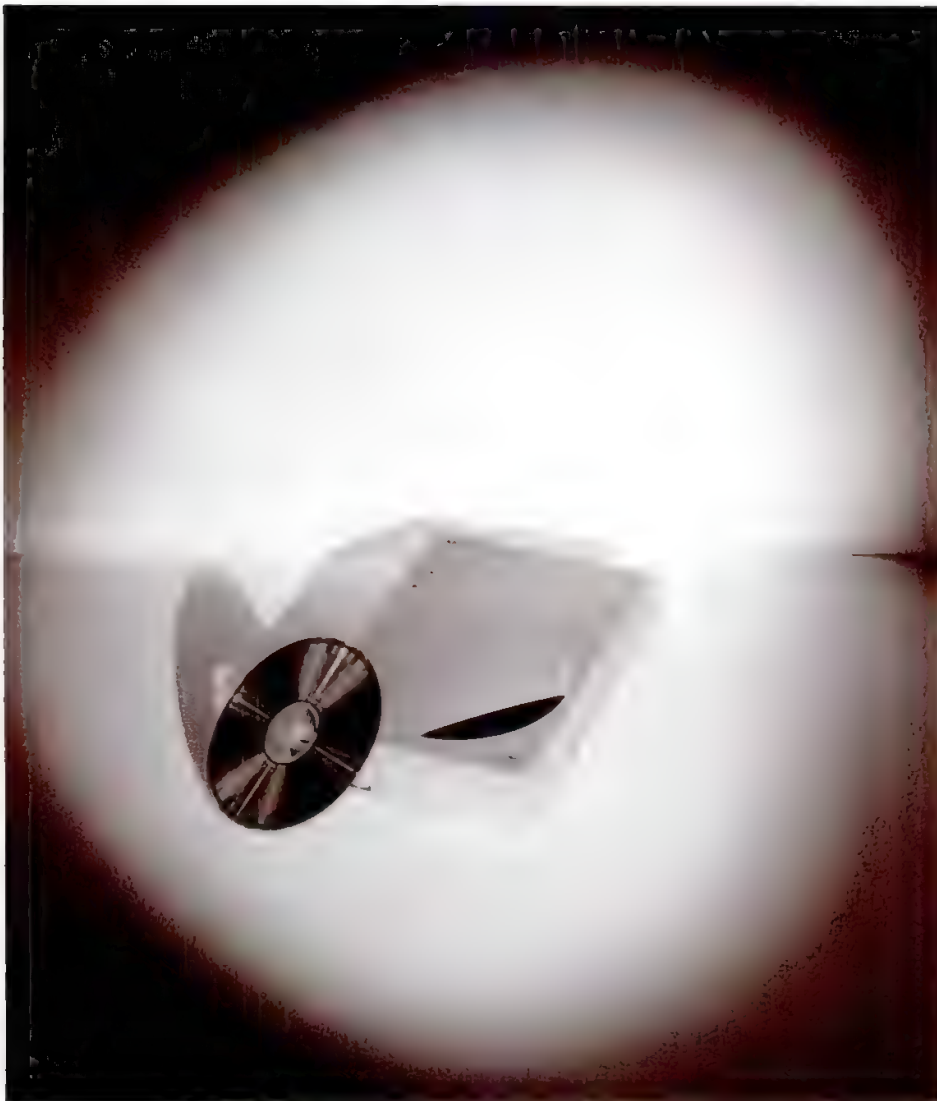
NEC's PowerMate[®] 386/331
with a local video bus is
the perfect complement
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CIRCLE 375 ON READER SERVICE CARD

COMMUNICATIONS REMOTE-CONTROL SOFTWARE

Takeover Lite's pull-down menu interface makes it easy to add new entries to your dialing directory or make copies of old entries that you want to modify.



Other features include SENTRY, a security program that controls access to the host's drives, directories, and files. Despite SENTRY, a lot of processing happens unbeknownst to the host. File transfer, for example, takes place in the foreground on the guest, but in the background on the host. At connection time, "silent" processing can create potential problems: Unless a user at the host end sees or hears the modem, the host is not notified of an incoming call and does not have the option of refusing it.

The package includes a scripting language called PRISM (PROgrammable Integrated Scripts for *Mirror*). PRISM allows you not only to automate your communication tasks but to design user interfaces as well. It includes powerful



PERFORMANCE TESTS: MODEM REMOTE-CONTROL SOFTWARE

Although network traffic can lower throughput when you are using LAN remote-control software, data compression methods are primarily to blame when a modem remote-control program achieves poor file-transfer results. Across the board, when companies spent more effort writing their data compression algorithms, their products spent less time transferring our 150K test file from guest to host.

WHAT THE NUMBERS MEAN

In the process of data transfer, the algorithm each product used for on-the-fly data compression made all the difference in its performance. The highest-ranking products—Norton-Lambert Corp.'s *Close-Up* (one of two Editors' Choice winners), Microcom's *Carbon Copy Plus*, and Ocean Isle Software's *ReachOut*—made the top tier of transfer speed because they used proprietary algorithms.

Further down the line were products that are based on optimized versions of readily available public-domain algorithms. While this approach does produce adequate transfer speeds, the slower results of *CO/Session* and *Takeover Lite* demonstrate some apparent consequences. *CO/Session* has so many saving graces—such as speedy file-tagging for batch transfers—that its mediocre result could not keep us from making the product an Editors' Choice.

The second-slowest product reviewed, *Central Point Commute*, relies on essentially the same algorithm as Central Point Software's tape backup product. The result of this shortcut: *Central Point Commute* took more than a minute longer to transfer our test file than did *Close-Up*, the speed leader of the pack.

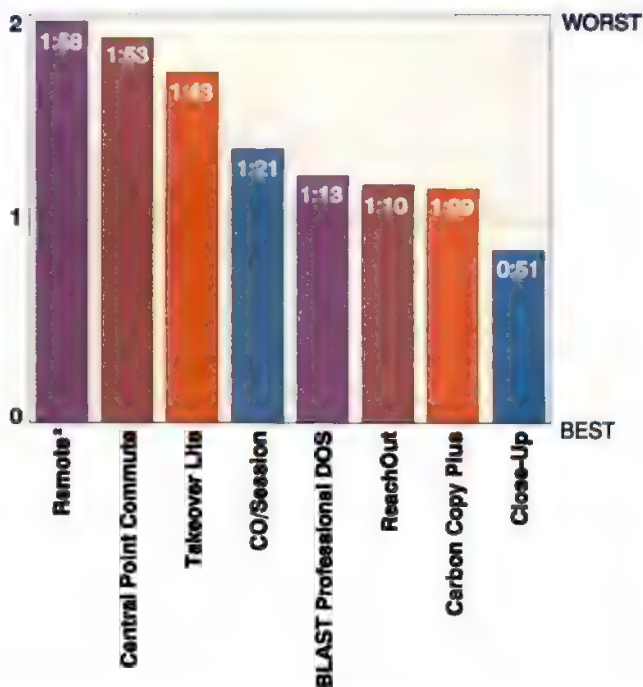
HOW WE TESTED

The modem remote-control test-bed consisted of two Compaq Deskpro 386/25e workstations, each with 4MB of installed RAM, DOS 5.0, a US Robotics Courier V.32bis modem, and a Microsoft Mouse. One of the workstations acted as host, the other as guest. The guest dialed into the host via a PBX (private branch exchange) system simulated by the Panasonic Electronic Modular Switching System, Model 616 EASA-Phone. The guest transmitted at 19.2 kilobits per second, the highest common rate attainable by every product we reviewed.

In our 150K File Transfer test, we transfer one 150K text file from the guest PC to the host over a simulated phone line and time the number of seconds each product takes to send the file.

150K FILE TRANSFER

Elapsed Time (minutes:seconds)





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COMMUNICATIONS REMOTE-CONTROL SOFTWARE

While it doesn't claim to support Windows, *Takeover Lite* was able to draw Windows screens on the guest PC once we'd established a connection with a host already running Windows.

programming options, such as special screen displays and pop-up dialog boxes that can initiate a function with a single keystroke. *Takeover Lite* also provides several terminal emulations and file-transfer protocols.

FAST FILE TRANSFERS

Takeover Lite transferred files easily, though with mediocre transfer times. Both data compression and error checking are available, but not virus protection. While the package doesn't claim to support Windows, *Takeover* was able to draw Windows screens on the guest PC, though only after we established a connection with a host already running Windows. The host screen also became unreadable when we tried to launch an application. If we launched Windows after connecting, the guest PC showed the mouse pointer but then disconnected.

Within the DOS Shell we could use the mouse and load *WordPerfect* and *Lotus 1-2-3*, but *1-2-3* would not consistently load. If we enabled the special keyboard driver, we could toggle between applications from the guest keyboard, something few of the other packages could accomplish.

As with Windows, *SoftKlone* does not claim to support *DESQview*, and *Takeover Lite* could not switch between remote applications running under *DESQview*. The program did have guest mouse support under *DESQview*, although it

appeared a bit choppy. Sometimes the guest's screen would blank out when loading an application but the guest would maintain keyboard functionality. When a command caused the guest screen to redraw, all was restored. In both the DOS Shell and *DESQview*, colors were sometimes slightly off and screen draws were slow.

Like all of our remote-control packages, *Takeover Lite* passed our LAN testing with no problems. For more complete LAN support, *SoftKlone* would need to offer a LAN remote-control product as well. Free technical support is available at a toll number from 9:00 A.M. to 5:00 P.M. E.S.T., and a BBS is available 24 hours a day.

Given time to mature, this product and its wealth of features will probably be able to go head-to-head with other packages that support more advanced applications. *Takeover Lite*'s file-transfer times are adequate, and if this is all you are looking for, you won't go wrong. But since you can have more advantages for a similar price in other packages, *Takeover Lite*'s attractiveness does fade.

Michael Cohn is a staff editor at PC Magazine. Carol Ellison, a free-lance writer based in New York City, is a frequent contributor to PC Magazine. Angela Gunn is an editorial assistant at PC Magazine. Wendy Dugas Pérez is a frequent contributor to PC Magazine and a former project leader at PC Magazine Labs.



Takeover Lite, Version 2.0

SoftKlone Corp., #100, 327 Office Plaza Dr., Tallahassee, FL 32301; 800-634-8670, 904-878-8564.

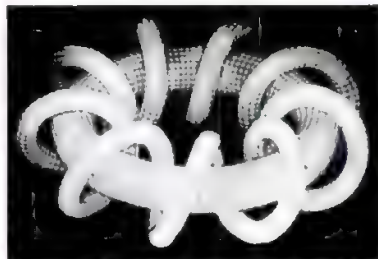
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In Short: While its features set lies in the top tier among the programs reviewed, *Takeover Lite* loses out with its mediocre speed and lack of support for Windows and *DESQview*. LAN remote-control is also missing as an option.

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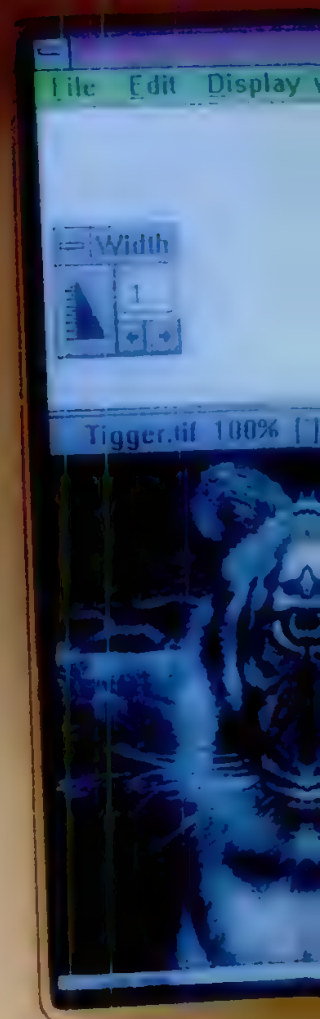
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CIRCLE 026 ON READER SERVICE CARD

EISA ESDI

CONTROLLERS:

THE CHOICE FOR POWER USERS

BY JAMES KARNEY

If you are a serious power user or network administrator in need of reliable mass storage on a fast 32-bit bus, your best choice may be an ESDI hard disk and controller. While network administrators who don't mind a few risks may opt for SCSI (small computer system interface) storage systems, and users on a budget often choose IDE (integrated drive electronics) disk technology, power users searching for no-hassles deals

IDE isn't big enough,
and SCSI is still chancy.

The best disk subsystem for power users is an ESDI subsystem. It offers maximum capacity and stable storage. These four ESDI controllers take advantage of bus mastering and EISA's 32-bit architecture to provide optimum hard disk performance.

HIGHLIGHTS: EISA ESDI Controllers

■ ESDI controllers for EISA systems can take advantage of that architecture's 32-bit bus and bus-mastering support to optimize disk performance.

■ ESDI disk subsystems are today's choice for individual power users and also many network environments. ESDI subsystems have in their favor fast transfer rates and storage capacities of 1GB or more. Additionally, any ESDI controller will work with virtually any ESDI hard disk.

■ ESDI disk subsystems face competition from SCSI and IDE disk subsystems. Although SCSI host adapters can control a range of devices and have other features that make them particularly attractive for network use, the various interpretations of the SCSI standard still make it a risky choice for many. IDE subsystems are a low-cost choice, but few IDE hard disk manufacturers offer systems with more than 350MB of storage.

■ For many single-user applications, an EISA ESDI controller without a hardware cache may be the wisest and most cost-effective choice, provided you put a software cache to work with it.

■ With some networks and multi-user operating systems, an EISA ESDI controller with a software cache will actually hamper performance. In those cases, users may be better off opting for a controller with an on-board cache. ■

on high-performance, high-capacity hard disks find that ESDI is today's solution.

For many power users, an ESDI disk subsystem will be coupled with a fast, high-performance machine. To get the most out of powerful 80386 and 80486 processors, most manufacturers recommend a bus architecture that can handle high-performance hard disks and move data efficiently—in other words, a bus

architecture like MCA or EISA. When we last reviewed high-end 486/25 machines (*PC Magazine*, June 11 and June 25, 1991), it was clear that EISA held the lead over MCA in terms of the types of systems vendors are manufacturing.

PC vendors such as Compaq, Dell, Gateway, Northgate, and Zeos market EISA systems that are at least twice as fast as comparable ISA systems and possibly up to three times as fast with advantages such as bus mastering. This performance increase is mainly due to EISA's 32-bit-wide data path, compared with ISA's 16-bit data path. The ISA bus requires two clock cycles to transfer data, while EISA requires only one. The result is a potential 264MB transfer rate, compared with ISA's 64MB limit.

Further potential performance gains are offered to EISA users via bus mastering, which allows expansion cards like hard disk controllers to handle their own transfer functions. This relieves the CPU of those tasks and speeds up the system.

REVIEW CRITERIA

ESDI hard disks are not usually sold with a controller. They may come bundled together with computers from some vendors, but in most cases it will be up to you to match your ESDI hard disk with the right controller. In this review, *PC Magazine* looks at four ESDI controllers for EISA systems: the DTC 6195-24 EISA ESDI Disk Controller (from Data Technology), the UltraStor Ultra 22CA EISA Caching ESDI Disk Controller, the UltraStor Ultra 22F EISA ESDI Disk Controller, and the Wyse WY-951 EISA Turbo ESDI Drive Controller. To be reviewed, each controller had to provide full EISA support, including bus mastering. Although we didn't require that the systems come with a cache, all but one (the Ultra 22F) provide hardware caching.

The controllers can fit anywhere from 512K up to a whopping 16MB on-board. They range in price from \$595 for the noncaching Ultra 22F to a princely \$1,494 for the Wyse WY-951 with 2MB of RAM. The Wyse WY-951 is an OEM version of UltraStor Corp.'s Ultra 22C (not reviewed here) with minor enhancements for computers from Wyse Technology.

CHOOSING A DISK SUBSYSTEM

There are four primary considerations when choosing a disk and controller for

Bus mastering offers
EISA users further
performance gains
because it allows
EISA controllers to
handle their own
transfer functions.

any architecture: capacity, performance, cost, and compatibility. Capacity can be defined in six words: as much as you can afford. No matter how large a hard disk you buy, you will eventually need more space, so plan ahead. Performance is a combination of hard disk speed, controller quality, caching, and the type of applications you most commonly use. Cost is not the best gauge of how a hard disk subsystem will perform; more money does not guarantee a better design.

For optimal operation, you have to concentrate on the last of the four criteria: compatibility. The hard disk and controller must suit each other and the other system components. Let's take a look at how the IDE, ESDI, and SCSI subsystem approaches stack up against each other.

IDE: THE LOW END

IDE disk subsystems are relatively inexpensive (usually around \$50 to \$100 cheaper than equal-capacity SCSI or ESDI hard disks), which makes them a favorite for low-cost systems. IDE disk subsystems have most of their controller functions built onto the hard disk; the IDE interface card is there essentially to allow the controller on the hard disk to communicate with the bus. Building most of the components into the hard disk means fewer circuits and more reliable operation.

IDE hard disks offer reasonable performance, but don't be fooled by advertised access times for IDE hard disks that closely match the 15-millisecond average access time of a SCSI or ESDI hard disk. These times are often obtained after dividing the hard disk into 32MB partitions; if you use the hard disk as a single partition (as allowed in DOS 4.01 and higher versions), it will probably slow down.

HARDWARE EISA ESDI CONTROLLERS



EDITORS' CHOICE

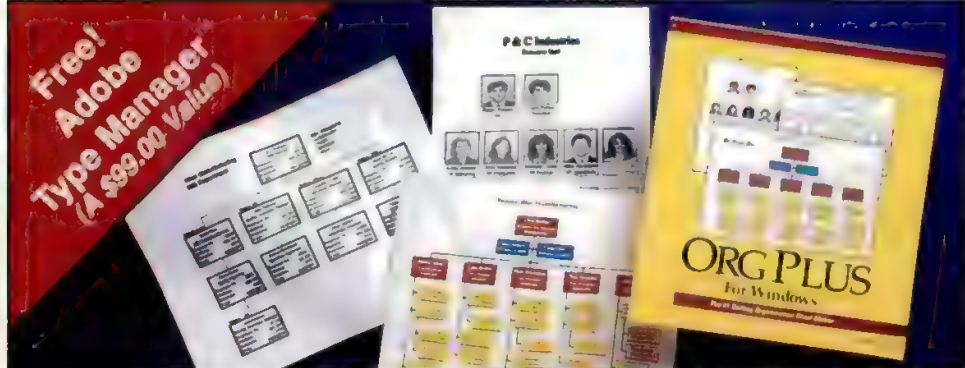
■ No standout performer

Of the four EISA ESDI controllers reviewed here, no board stands out as the all-around winner. While each of the contenders has certain points in its favor, none really provides an overwhelming advantage over the others in terms of features, speed, and price.

An honorable mention goes to the \$795 UltraStor Ultra 22CA EISA Caching ESDI Disk Controller, a board that combines ease of installation, a reasonable price, and good if not remarkable performance. The \$1,494 Wyse WY-951 EISA Turbo ESDI Drive Controller has an edge over the Ultra 22CA in terms of speed, but not enough to justify its higher price tag or make up for the fact that it consumes two slots and does not include support for any floppy disk drives. The DTC 6195-24 EISA ESDI Disk Controller is priced as reasonably as the Ultra 22CA, but its performance and installation procedures are not up to par. If you require a board with hardware caching, the Ultra 22CA is your best bet.

Users who need hardware caching are a very specific audience, though—networks and power users with no more room to install a system RAM cache. For most other individual power users, the best choice lies with a noncaching controller with a look-ahead buffer, provided it is coupled with a software caching program and a system RAM cache.

In that configuration, the \$595 UltraStor Ultra 22F EISA ESDI Disk Controller provided the all-around best performance of the four products. Its 64K look-ahead buffer boosts its performance on sequential reads, while the 2MB of system RAM allocated for software caching lead to the top scores on our random read and write tests. Without the help of the software cache, however, its scores on these two tests were the worst of the lot.



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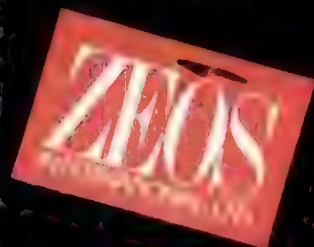
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HARDWARE

EISA ESDI CONTROLLERS

EISA ESDI CONTROLLERS: A LOOK AT THE COMPONENTS

Most of the EISA ESDI controllers in this review are marked by a custom RISC (reduced instruction-set computing) chip, like the one shown in the photograph of the UltraStor Ultra 22CA EISA Caching ESDI Disk Controller, below. The exception is the Wyse WY-951 EISA Turbo ESDI Drive Controller, which uses a 16-bit custom CISC (complex instruction-set computing) chip. The difference between the two designs is that CISC architecture maximizes the number of instructions the processor chip itself performs, while RISC architecture places more of the processing burden on software, such as the operating system.

Most of the boards in this review use an Intel controller chip. With the exception of the Wyse WY-951, each product's controller chip allows the board to manage hard disks and floppy disk drives. The Ultra

22CA pictured here, as well as its noncaching sibling, the UltraStor Ultra 22F EISA ESDI Disk Controller, is capable of managing up to two ESDI hard disks and three floppy disk drives. The DTC 6195-24 EISA ESDI Disk Controller handles the same number of hard disks, but it doubles the number of supported floppy disk drives. The Wyse WY-951 supports two hard disks only.

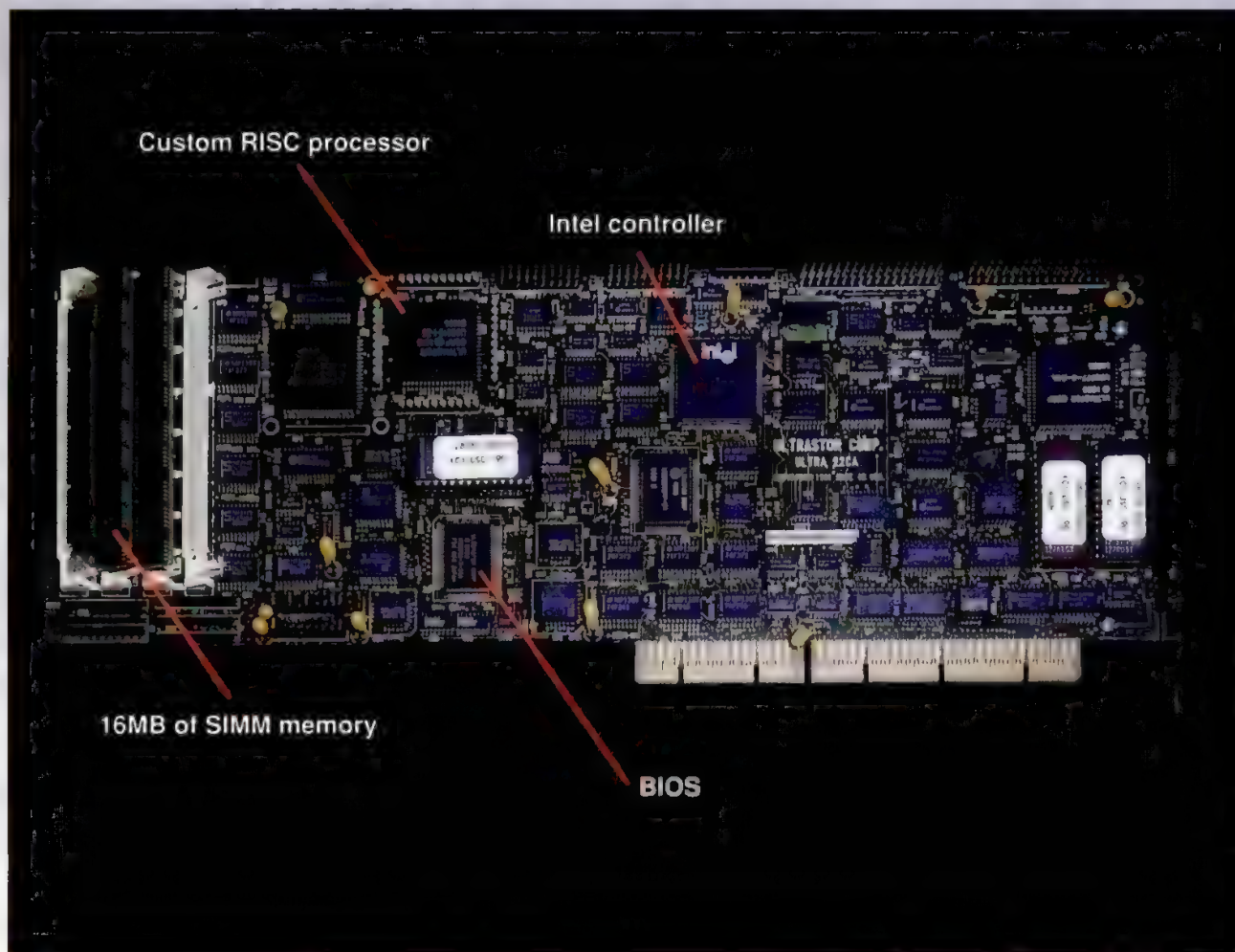
The three caching controllers reviewed here differ in the amount of RAM they can hold, and even in the type of memory modules used. The caching controllers from Data Technology and UltraStor use standard DRAM SIMMs (single in-line memory modules); the Wyse board instead accommodates more-expensive VRAM.

While the DTC 6195-24 is limited to only 2MB of RAM, and the Wyse WY-951 holds twice that amount, the Ultra 22CA fits

up to a whopping 16MB of RAM. The photograph shows the board in its fully configured state. Our tests show that a 16MB hardware cache does not offer a significant improvement over a 2MB hardware cache when the size of the file to be read or written does not exceed 2MB. Users who typically deal with very large database files, however, may appreciate the ability to pack as much RAM on-board as possible.

While all the caching boards are full-length AT-style cards, the Ultra 22F is only a three-quarter-length card. Its smaller size is due to the absence of a hardware cache.

On all of the controllers reviewed here, DEBUG is used to set the BIOS-level options, which include setting optional sector sparing, mapping the number of sectors per track, and setting the number of heads supported.



HARDWARE

EISA ESDI CONTROLLERS



EISA ESDI CONTROLLERS: SUMMARY OF FEATURES

Products listed in alphabetical order

The four EISA ESDI controllers we review here have a number of features in common. For instance, all support DOS, Microsoft Windows 3.0, OS/2, *NetWare*, *LAN Manager*, and Unix. All support IBM PC AT drive-type table numbers, disk mirroring, and multiple controllers in one PC. Additionally, each product requires you to perform a low-level format of the hard disk as part of the installation procedure.

The UltraStor Ultra 22F EISA ESDI Disk Controller is the only controller that does not use a hardware cache. We tested the rest with a 2MB hardware RAM cache.

☒—Yes ☐—No

	DTC 6195-24 EISA ESDI Disk Controller	UltraStor Ultra 22CA EISA Caching ESDI Disk Controller	UltraStor Ultra 22F EISA ESDI Disk Controller	Wyse WY-951 EISA Turbo ESDI Drive Controller
List price (tested configuration)	\$792	\$795	\$595	\$1,494
POWER REQUIREMENTS				
Maximum voltage (volts)	5	5	5	5.25
Maximum amperage (amps)	3.2	2.9	1.5	3.5
MEMORY				
Minimum cache RAM required on-board	512K	512K	N/A	512K
Maximum cache RAM supported on-board	2MB	16MB	N/A	4MB
Board uses volatile cache RAM	☒	☒	N/A	☒
Type	SIMM	SIMM	N/A	VRAM
Size	256K, 512K, 1MB	256K, 512K, 1MB, 4MB	N/A	256K
Maximum number of cache ways	1	N/A	N/A	2
PHYSICAL SPECIFICATIONS				
Form factor	AT full-length	AT full-length	AT three-quarter-length	AT full-length
Number of slots board occupies	1	1	1	2
Number of hard disks supported	2	2	2	2
Number of floppy disk drives supported	4	3	3	None
Maximum transfer rate (megabits per second)	24	24	24	24
Maximum burst speed (megabits per second)	33	33	33	33
Cache processor	Custom RISC	Custom RISC	N/A	Custom CISC
CONFIGURATIONS				
Card drive type table-independent	☒	☒	☒	☒
Supports nonstandard drive types through hardware or software	Hardware	Hardware	Hardware	Hardware
Largest drive size supported	8GB	8.5GB	8.5GB	2.1GB
Number of cylinders supported	1,024	2,048	2,048	4,096
Number of heads supported	256	64	64	16
Number of sectors per track supported	256	127	127	127
IRQ levels supported	2 (14–15)	6 (10–15)	6 (10–15)	6 (10–15)
SOFTWARE INCLUDED				
Setup	☒	☒	☒	☒
On-board diagnostics	☒	☒	☒	☒
Performance tests	☐	☐	☐	☐

N/A—Not applicable: The product does not have this feature.



PERFORMANCE TESTS: EISA ESDI CONTROLLERS

Our tests show that an EISA ESDI controller with a software cache can be more effective than one with a hardware cache—at least for single-user applications. Whether you use a hardware or software cache, controller performance decreases when the size of the data file exceeds the cache size.

HOW WE TESTED

For our EISA ESDI bus-mastering controller tests, we used an EISA-based Dell 433DE—a 486/33 machine—with 16MB of memory and a 768MB Maxtor 8760E hard disk with a transfer rate of 15 megabits per second. We installed DOS 5.0 on our test-bed Dell computer. We also installed PC-Kwik, Version 2.1, for our software cache tests.

All EISA ESDI controllers were installed and configured according to their respective manufacturers' guidelines. We allowed each controller to warm up to operating temperatures prior to testing.

For our tests, we configured the caching boards with 2MB of cache RAM. We ran tests on the caching UltraStor Ultra 22F EISA ESDI Disk Controller, the only board with no hardware caching, in both its native noncache mode and in conjunction with the PC-Kwik caching software and a 2MB system RAM cache.

We used a modified version of the DOS File Access test from PC Magazine Labs' Hardware Performance Tests, Release 5.6. These tests measure each controller's ability to handle both large and small files, using records of 2,048 bytes and 200 bytes, respectively.

For each test, we ran the controllers through seven different file sizes, from 60,000 bytes to 3,932,100 bytes. We report the results from only five tests, using files ranging in size from 240,000 bytes to 3,840,000 bytes. For each file size, we performed the test three times; we report an average of the three trials. These tests show how the controllers performed inside the cache (when the file is smaller than the cache) and outside the cache (when the file is larger than the cache).

WHAT THE NUMBERS MEAN

On all the large- and small-record tests, we found that when the boards used either a hardware or software cache, they slowed down when the file size exceeded the cache size. This happens because the controller is forced to perform multiple disk accesses before reading or writing to the disk when the file size is greater than the cache size.

On almost every test, the noncaching UltraStor Ultra 22F EISA ESDI Disk Controller turned in the poorest results of all when run without the PC-Kwik software cache. The exceptions were the Small-Record Sequential Read test, on which the Ultra 22F still turned in respectable middle-of-the-pack performance without software

caching employed. On the Large-Record Sequential Read test, the UltraStor 22F (without software caching) beats the nearest competitor by nearly two to one when the file size reaches 1MB and beyond. These performance improvements are to be expected from sequential reads; the UltraStor 22F comes with a 64K look-ahead buffer, and sequential file accesses are an inherent design feature of a look-ahead buffer. A cache, on the other hand, has its strength in assembling together random pieces of data for retrieval.

On the Small-Record Random Write test, the Large- and Small-Record Random Read tests, and the Large- and Small-Record Sequential Read tests, the UltraStor 22F with the PC-Kwik software cache proved to be the fastest performer—sometimes by a large margin—up to the point where the file size exceeded the software cache size. On the Small-Record Sequential Read test, it was nearly twice as fast as the next-fastest board, the costly Wyse WY-951 EISA Turbo ESDI Drive Controller, when the file size did not exceed the cache size.

Interestingly, the hardware cache supported by the UltraStor Ultra 22CA

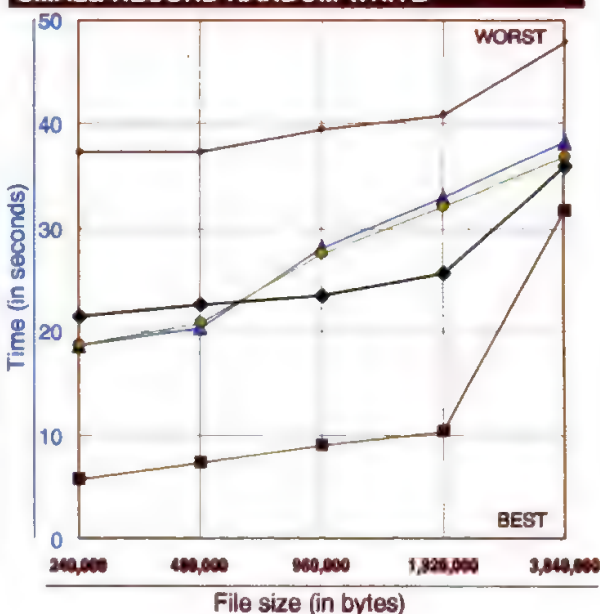
EISA Caching ESDI Disk Controller and the Wyse WY-951 showed a relative degradation in performance when the file size approximated the cache size, but it otherwise performed well. Hardware-cached controllers really come into their own in multiuser or network environments, where the benefits of a software cache are minimized. In those environments, as the drivers and operating system utilize more system memory, less memory is available for use as a disk cache. Consequently, a hardware cache should improve system performance, though disk-controller performance would be unchanged.

In supplementary informal tests, we installed the Ultra 22CA in our test-bed with a full 16MB hardware cache and ran it through the same battery of tests. We found that the 16MB-equipped board performed similarly to the 2MB-equipped board until the file size exceeded 2MB. At this point, the 16MB-equipped Ultra 22CA slowed only marginally, whereas the 2MB-equipped version slowed considerably. This indicates that for optimum performance, the cache size should equal or better the read or written file size.

The Small-Record Random Write test writes 200-byte records to a file and is comparable to updating a record in a database file.

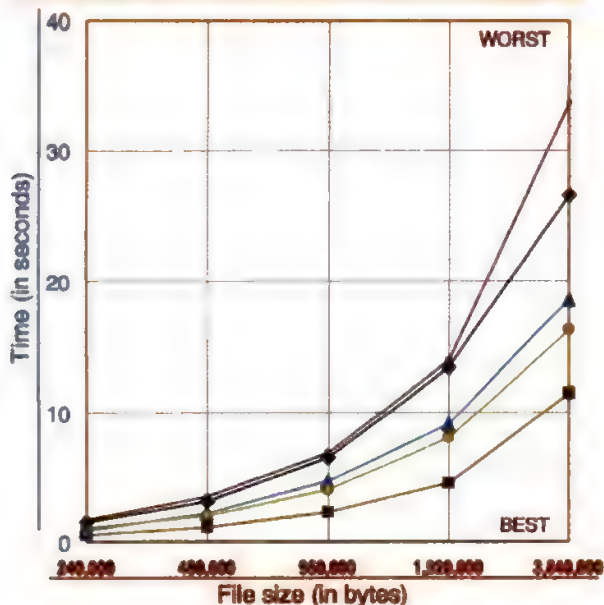
- UltraStor Ultra 22F EISA ESDI Disk Controller (with PC-Kwik)
- ▲ UltraStor Ultra 22CA EISA Caching ESDI Disk Controller
- Wyse WY-951 EISA Turbo ESDI Drive Controller
- ◆ DTC 6195-24 EISA ESDI Disk Controller
- UltraStor Ultra 22F EISA ESDI Disk Controller (without cache)

SMALL-RECORD RANDOM WRITE



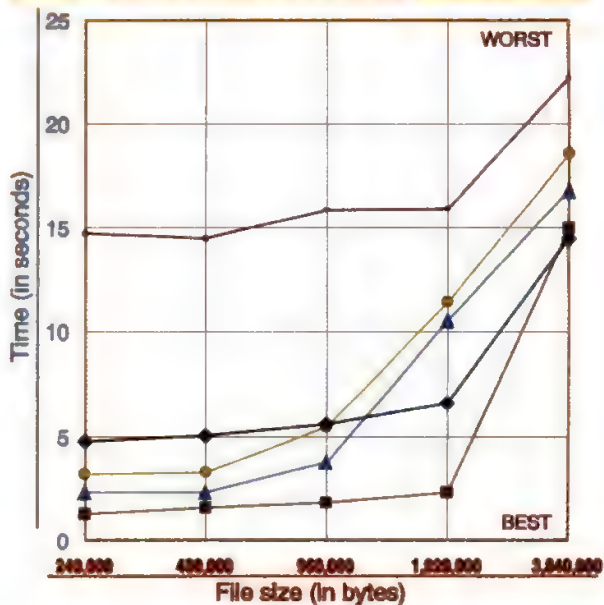
The **Small-Record Sequential Read** test reads 200-byte records sequentially from a file and is similar to running a database report.

SMALL-RECORD SEQUENTIAL READ



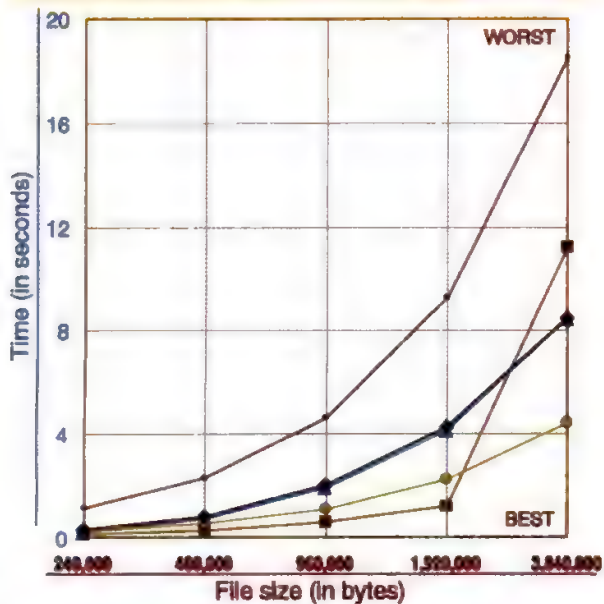
The **Small-Record Random Read** test reads 200-byte records randomly from a file and is akin to searching for a database record.

SMALL-RECORD RANDOM READ



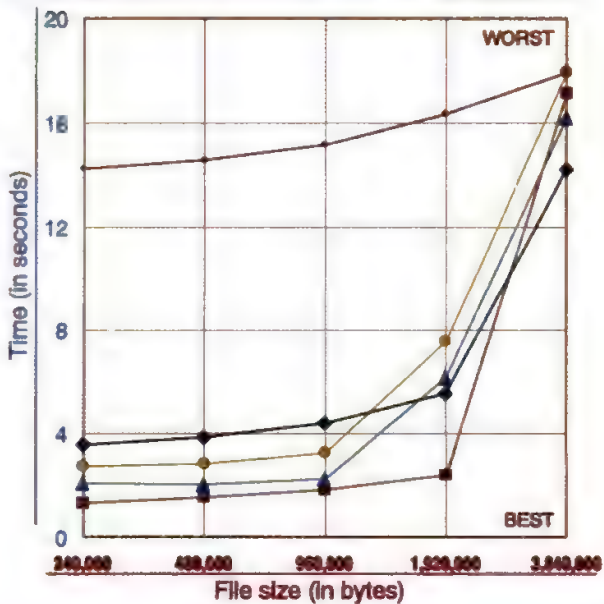
The **Large-Record Sequential Read** test reads 2,048-byte records sequentially from a file and is comparable to loading a program from disk.

LARGE-RECORD SEQUENTIAL READ



The **Large-Record Random Read** test reads 2,048-byte records randomly from a file and is similar to reading a word processing document or spreadsheet data file from disk.

LARGE-RECORD RANDOM READ



SETTING UP FOR SMOOTH PERFORMANCE

Are you a little daunted by the size and complexity of your new ESDI subsystem? Here are some suggestions that will help smooth things out.

by James Karney

Whether you're using an EISA, ISA, or MCA system, getting the most from an ESDI controller and high-capacity hard disk requires attention to detail and a preventative maintenance program. Failure to observe a few rules can result in wasted storage space, reduced performance, and even data loss.

DOS was not designed to handle hard disks with more than 1,024 cylinders. The 768MB (unformatted) Maxtor 8760E hard disk we used to test the controllers in this article has 1,632 cylinders—typical of ESDI hard disks with that kind of storage capacity. To obtain access to the disk's full capacity, the controller must perform some sleight of hand and tell DOS that the drive has fewer cylinders with more data for each one. This is known as *translation*. If you use the wrong setting when installing the card, the disk's working size may drop. In one instance, failure to properly install a card reduced the Maxtor disk's formatted capacity of 630.7MB to a mere 397MB.

HARD DISKS AND CONTROLLERS

One common call new users make to technical support involves properly setting up an ESDI controller and hard disk to work together. If the number of sectors is set too high, you may see a host of "Sector and/or Record Not Found" errors. Try lowering the number of sectors per track until the problem disappears. Generally, the lower the number of sectors per track, the higher the accuracy—and the less available storage space.

All the EISA ESDI cards reviewed in this article can handle the fastest ESDI hard disks available today. Pairing an older and slower controller (for any bus) with a new high-performance hard disk will not work. ESDI hard-

ware throughput ranges from 10 to 24 megabits per second. A faster card may be backward-compatible (it can handle slower hard disks), but the reverse is not possible. Call the hard disk manufacturer or dealer to make sure the controller supports the disk.

TRANSLATION DIFFICULTIES

Translation causes difficulties for hard disk diagnostic programs like Gibson Research's *SpinRite II* or Symantec Corp.'s *Calibrate* (included with *The Norton Utilities*). While they may be able to perform some tests, these programs cannot accurately perform a non-destructive low-level format. Don't even try; the code used in these programs was written to handle IDE and MFM interfaces but not SCSI or ESDI. If it seems your low-level format is weak (increased read and write errors as well as phantom data), try lowering the number of sectors. If this fails, you can always back up and reformat.

Just because your controller and hard disk are up and running, you should not assume you are getting the maximum performance. Changing the cache size, altering the number of buffers listed in your CONFIG.SYS file, and reducing file fragmentation can all improve operation. The time spent tweaking these three items can dramatically improve your system. A good rule of thumb is to drop the number of buffers as the cache is increased; for example, with the 2MB cache size used during this round of PC Magazine Labs' performance tests, we lowered the buffers statement from 20 to 3.

The type of applications the system uses, how often files are modified, and the amount of disk reads and writes vary among users. Experimentation is a must to determine the right settings for your system. ■

The typical access time for an IDE hard disk when used as a single partition is about 23 ms. Though this is noticeable, the decrease in speed is really not that severe, especially in a single-user environment.

IDE drops out of the running for serious high-capacity storage because of the limited size of available drives; you won't find many with capacities above 350MB. Additionally, IDE interfaces and disk subsystems for the EISA bus are not exactly swamping the market. Vendors in the EISA market apparently believe that their users want serious storage power—from 650MB to 1GB and beyond. At these high-capacity storage levels, IDE hard disks just don't exist.

SCSI: THE WAVE OF THE FUTURE

SCSI is a high-speed bidirectional interface that allows up to seven devices to be attached to one SCSI host adapter. As with IDE disk subsystems, the actual controller intelligence for the SCSI disk is on the drive itself. The devices that can be attached to the host adapter are not limited to hard disks; printers, optical drives, tape units, CD-ROM drives, and scanners are among the peripherals currently available for use with a SCSI interface. The host adapter can make a request of one device and then release control over that device; the host adapter is thereby free to make a request for a new client, be it another software package or network workstation.

SCSI has many advantages that can make it particularly attractive for network environments. Besides its ability to multi-task client requests, you can chain several hard disks together, any of which can have an unformatted capacity of 1,700MB or even up to 2,100MB. And you get fast throughput—typical transfer rates up to 40 megabits per second, or even 80 Mbps in some cases.

Unlike IDE and ESDI technologies, SCSI requires a device driver for the host adapter. Device drivers may come from the hardware manufacturer or even a third-party developer. While there is an American National Standards Institute (ANSI) standard for SCSI, it leaves a lot of room for customization. At the moment there are three popular interpretations of the SCSI 1 standard: SCSI 2, Fast SCSI, and Wide SCSI.

This profusion of interpretations translates into confusion in the SCSI marketplace. Ideally, a user should be able to attach a number of different devices to a single SCSI host adapter. But because of

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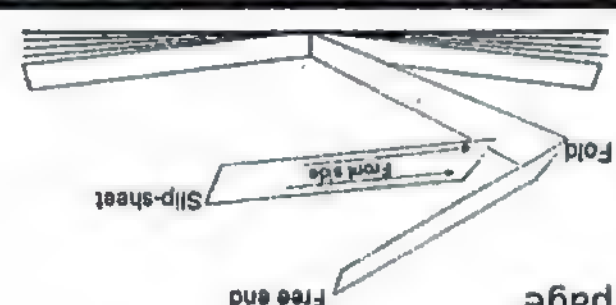
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Inverted Foldout slip-sheet



Foldout slip-sheet

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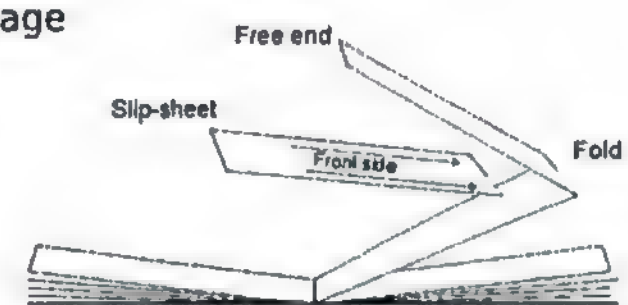
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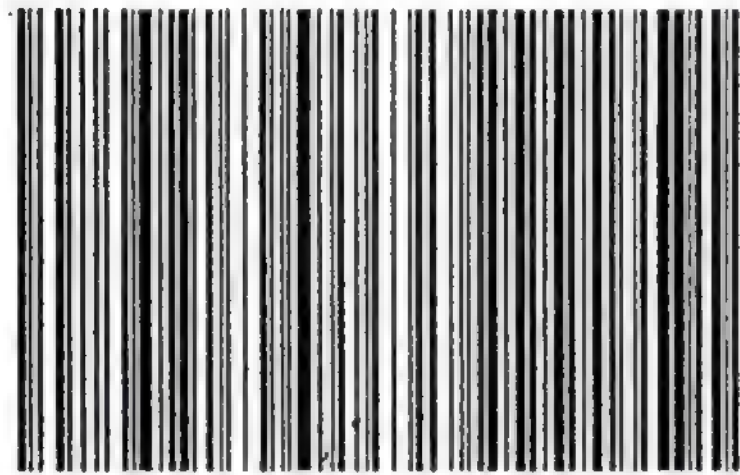
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4. Close the page and slip-sheet



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Back

1. Follow instructions on the other side

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PCM492

HARDWARE

EISA ESDI CONTROLLERS

incompatibilities between drivers or devices—even those that purport to follow the same SCSI interpretation—you may have to install an additional host adapter for a new SCSI peripheral. Additionally, some vendors' SCSI device drivers have problems with enhanced 386-mode operations, and others may conflict with the drivers for the video, network, or any other board in your PC.

SCSI also adds a layer of commands from the host to the device, one that degrades performance slightly in a single-user system—between 2 and 10 ms., or about 12 percent. But for intense multitasking and network operations, SCSI's ability to handle more than one request at a time easily compensates for the command overhead.

SCSI has the advantage of great flexibility, excellent performance, and a high capacity. Network administrators can profit by it today, but others may want to wait until the technology has been better standardized, especially considering the average list price of most SCSI hard disks. Typically, a 5.25-inch 500MB SCSI hard disk will have a street price of about \$1,500 while a 3.5-inch unit will run about \$1,700. A 1GB hard disk could go for as much as \$3,000 for a 3.5-inch unit and \$2,200 for a 5.25-inch device.

ESDI LIVES TODAY

ESDI is a souped-up version of the Shurgart ST-506 interface used for the original PC hard disks. ESDI hard disks can match the storage capacity offered by SCSI hard disks and are comparable in price. A single ESDI controller, however, cannot support multiple devices the way SCSI controllers can. On the other hand, ESDI technology is not in the state of flux that SCSI is. If you buy an ESDI hard disk and plug it into any EISA ESDI controller reviewed here, the two should work. (You should be aware, however, that older ESDI controllers can sometimes have problems with newer ESDI hard disks. For more information, see the sidebar "Setting Up for Smooth Performance.")

As with SCSI hard disks, the highest-performance ESDI disks can hold up to 1GB or even 2GB of data. (Some of the manufacturers of the ESDI controllers reviewed here claim to support hard disks of 8GB or more, but these don't exist in the real world. What the vendors have actually done is build in a translation table with that capability.) ESDI hard disks have transfer rates of 24 Mbps at the upper end, though

17 Mbps is a more real-world figure. The manufacturers of the controllers reviewed in this article claim that their products handle transfer rates with burst-transfer speeds of up to 33 Mbps. (Burst transfer involves shooting a small file through the disk interface at its highest speed. Because of the mechanics of hard disks, small files can be read and written more efficiently and speedily than larger files.) Typically, the actual speed of the controller will be limited by the transfer rate of the disk itself.

As with SCSI hard disks, the highest-performance ESDI disks can hold up to 1GB or even 2GB of data.

Since an ESDI controller does not require a device driver, you can purchase a wide variety of hard disks and expect full compatibility with the controller and your applications. The high performance and high compatibility of ESDI subsystems have lead many PC vendors to package ESDI hard disks with their systems; for example, at least five computer vendors use OEM versions of the UltraStor Ultra 22 series reviewed here.

ESDI is the disk of choice for today's power user. Its speed and capacity make it equally at home on networks as on the single-user machine. SCSI, though generally a superior technology, is hampered by having too many incompatible interpretations. IDE, though inherently an efficient solution, just cannot command the same number of megabytes that ESDI can. An ESDI hard disk subsystem that takes advantage of the 32-bit data path of today's powerful EISA computers offers the surest bet for high-capacity and high-performance mass storage.

TO CACHE OR NOT TO CACHE

The real question is not should you cache, but how you should cache. With the exception of the UltraStor Ultra 22F EISA

ESDI Disk Controller, all the boards we review here were equipped with a hardware cache.

You can buy software caching programs from companies like Central Point Software, MultiSoft, Qualitas, and Symantec. You first purchase the software and a significant amount of new system RAM (about 2MB is generally optimum). The software, once properly configured, will then allocate that portion of system memory as a cache. Generally, on single user systems this is faster than hardware caching because RAM located on a card must still access the data bus to get to the CPU; system RAM doesn't. Also, since your new memory is system RAM, it can do double—though not simultaneous—duty in case you run a memory-hungry application.

If you purchase RAM on a hard disk controller, the RAM is limited to caching only and is never available for your applications. For most single-user systems, it is often better to buy a noncaching controller and more system RAM, and also to set up a software cache. The exceptions are power users who need system RAM available for their applications at all times, and large, memory-hungry networks. On networks like Novell's *NetWare*, or even under multiuser operating systems such as OS/2 or Unix, a software cache might slow down performance because it takes over the memory that would otherwise be used for general network or multiuser applications. Additionally, using a hardware cache controller on a server relieves the network from the added bottleneck that occurs when a software cache is present. For those applications, a caching controller makes sense. Hardware caching also reduces possible software conflicts.

Our tests showed that both 2MB hardware and software caches produce dramatic performance gains. PC Magazine Labs's benchmark tests showed that when tested without a software cache, the Ultra 22F performed about 1.3 to 2 times as slow as its hardware-cache-equipped competition, and about 1.5 to 6.5 times as slow on average than when it was coupled with Multi-Soft's *PC-Kwik* caching software. Informal testing showed that a 16MB hardware cache did not generally offer a significant improvement over a smaller hardware cache.

TESTING THE CONTROLLERS

We started to test the four boards reviewed in this article with a Compaq Deskpro

486/33L and found that they wouldn't work properly with Compaq's EISA design. While the computer would load the third-party configuration files and seemed to recognize the third-party controllers, attempts to low-level-format the 768MB (unformatted) Maxtor 8760E hard disk invariably ended in failure. Compaq explained that we could avoid the problem, but only by using proprietary Compaq controllers.

We then turned to a Dell PowerLine 433DE, which comes with 16MB of RAM and is bundled with an OEM version of the UltraStor Ultra 22-series EISA/ESDI controller and a pair of matched Micropolis 1664-7 hard disks. We removed the controller and replaced the existing hard disks with a single 768MB Maxtor XT8760E hard disk. Each third-party card was installed in its turn, and each time, we low-level-formatted the hard disk with DOS 5 prior to running PC Magazine Labs' performance tests.

During installation, we had to deal with the EISA Configuration (CF) program that is common to all EISA systems. There were three possible places to adjust the configuration: the controller's BIOS, the computer's CMOS, and the CF routine. Failure to make sure that all agreed resulted in conflicts with floppy disk operations, hardware caching, or low-level hard disk formatting.

These minor adjustments aside, the ESDI controllers we review here by and large represent a good value for EISA system owners. They offer a risk-free, high-performance solution for networks or the individual power user.

DATA TECHNOLOGY

DTC 6195-24 EISA ESDI Disk Controller

All reviews by James Karney

The DTC 6195-24 EISA ESDI Disk Controller runs on a high-speed EISA bus and features either 512K or 2MB of on-board cache (at \$612 or \$792, respectively). We tested the 2MB version of the controller. The card provides support for operating two hard disks and up to four floppy disk drives, in both 3.5- and 5.25-inch formats.

The full-size single-slot board uses a

DTC 269 RISC processor to provide support for ESDI hard disks with a transfer rate of up to 24 megabits per second. It is capable of a 33-Mbps burst transfer. In addition to DOS, the DTC 6195-24 supports SCO, USL, ISC, and Microport's versions of Unix System V, as well as *NetWare* and OS/2. The full-length card only requires one slot and uses standard 256K, 512K, or 1MB SIMMs for the cache.

TRICKY SETUP

The hardware setup was slightly more complex than with the other review units. Data Technology has not quite implemented the "jumperless" EISA installation standard. The user must check and set two

Our tests on these systems show that both 2MB hardware and software caches produce dramatic performance gains.

DIP switches that control BIOS address and the floppy disk drive support and cabling, as well as the I/O port. The basic EISA setup involved running the computer's EISA configuration (CF) program with the supplied .CFG file, installing the card, and setting the system's CMOS and the adapter's BIOS configuration.

The BIOS settings are handled using the DOS debug routine and are then followed by a series of menu prompts. The utility allows mapping 17 or 63 sectors per track, and it supports up to 256 heads and 256 sectors per track. (Smaller ESDI hard disks contain less heads and therefore use only 17 sectors per track, whereas larger hard disks contain more heads and can take advantage of a larger amount of sectors per track.) Factory disk defects can be noted automatically using the DOS DEBUG utility if the hard disk table can be read, or you can do it manually. Optional sector sparing (reserving one sector per track for defect management) is also supported.

We found the manual and menus a little



FACT FILE

DTC 6195-24 EISA ESDI Disk Controller

Data Technology, a division of Qume Corp., 500 Yosemite Dr., Milpitas, CA 95035; 408-262-7700.

List Price: \$792.

Requires: Compatible EISA computer with ESDI hard disk.

In Short: Though its price is right, the DTC 6195-24 does not quite measure up in terms of performance or ease of installation.

CIRCLE 496 ON READER SERVICE CARD

short on explanations. With the increasing complexity and number of options, many users would appreciate a more helpful installation routine.

On our random read and write tests, the DTC 6195-24 was slower than the other hardware caching cards when the file size was smaller than the cache size. Though there was still a degradation in the DTC 6195-24's performance when the file size exceeded the cache size, in these instances the unit performed relatively better than its peers.

The DTC 6195-24 EISA ESDI Disk Controller could be improved in terms of performance and detail, but budget-minded shoppers requiring a hardware cache may want to take a closer look at this adapter.

ULTRASTOR CORP.

UltraStor Ultra 22CA EISA Caching ESDI Disk Controller

UltraStor Ultra 22F EISA ESDI Disk Controller

The UltraStor Ultra 22CA EISA Caching ESDI Disk Controller provides a burst-transfer speed of 33 megabits per second and supports 16MB of hardware cache using standard SIMMs. It sells for a list price of \$795 with 2MB of RAM. The \$595 UltraStor Ultra 22F EISA ESDI Disk Controller practically matches the Ultra 22CA

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HARDWARE

EISA ESDI CONTROLLERS

feature for feature, but it offers a 64K look-ahead buffer rather than a true hardware cache.

UltraStor Corp. is a relative newcomer to the hard disk-controller business, but it is rapidly gaining market share. In operation since 1989, UltraStor offers a full line of ESDI, IDE, and SCSI products for both EISA and ISA platforms. At least five major mail-order computer houses include Ultra ESDI controllers with their high-end systems. The Dell PowerLine 433DE tested we used for this story was one; it came bundled with an OEM version of the UltraStor Ultra 22C (not reviewed).

SIMMs AND MORE SIMMs

Unlike the Ultra 22C, which it replaces, the Ultra 22CA uses SIMMs rather than more expensive VRAM for its cache memory. The SIMMs fit on the front edge of the board, which eliminates the need for the daughterboard required by the Ultra 22C and also keeps the controller card from blocking the adjacent slot.

The Ultra 22CA we tested was sent with 16MB of RAM in four 4MB modules, a configuration that lists for \$1,195. For testing in standard 2MB mode, we downsized the RAM by replacing the modules with 1MB SIMMs. The board automatically identified the amount of on-board cache. One requirement is that the first two slots must have memory in place;

you can select from matching 256K, 1MB, or 4MB SIMMs.

Both the Ultra 22-series cards support two ESDI hard disks with transfer rates up to 24 Mbps and up to three floppy disk drives (if they're daisy chained). They provide support for DOS, SCO, USL, ISC, and Microport versions of Unix, as well as NetWare and OS/2. Two cards can be used in the same system, allowing the use of four hard disks under DOS 5.0 without special drivers.

Installing the
UltraStor controllers
and marrying them
to our Maxtor
8760E test disk was
wonderfully simple.

The company also claims that both products will support the new 2.88MB 3.5-inch hard disks that have been announced Chinon, Citizen, Sony, and TEAC.

SIMPLE INSTALLATION

Installing the controllers and marrying them to our Maxtor 8760E test disk was wonderfully simple. We used the CF program to load the appropriate EISA .CFG file and set the options. Then it was merely a matter of powering-down, placing each card in turn into a slot, rebooting, running DEBUG to set the controller's BIOS-level options, and low-level formatting the hard disk. We left the hard disk's on-board floppy disk controller active and disabled each card's controller. As we did with all the products, for both Ultra cards we used FDISK to set one large 631MB partition and performed a DOS 5.0 format to make the disk bootable.

The Ultra 22CA and Ultra 22F provide a menu-driven setup procedure available via DEBUG. Choosing the first submenu lets you set each card's primary options, such as the type of translation, ISA-mode support, spare track sectoring, and cache enabling or disabling. The second sub-

menu is used to run the low-level format and initialize the hard disk controller.

Setup was not difficult, but UltraStor should get out current documentation. We were given a manual that only covered an outdated version of the Ultra 22C. The company reported that new manuals are in the works.

On PC Labs' performance tests, the Ultra 22F was generally the fastest of any card tested when used with a system RAM cache and PC-Kwik caching software. It even outperformed the more expensive Ultra 22CA. These results show that a well-built noncaching controller using a software cache could be a wise and cost-effective choice in many situations. A hardware cache, however, is still the only solution for large, memory-hungry networks and those individuals with systems that have no more room for RAM. It is also worthwhile to point out that without a software cache in place, the Ultra 22F generally scored the poorest on our tests.

If you need a high-performance EISA controller with a hardware cache and want first-class features, the UltraStor Ultra 22CA EISA Caching ESDI Disk Controller should be on your wish list. On the other hand, users wanting a feature-rich card without a hardware cache will find the UltraStor Ultra 22F EISA ESDI Disk Controller a winner.

WYSE TECHNOLOGY

Wyse WY-951 EISA Turbo ESDI Drive Controller

The Wyse WY-951 EISA Turbo ESDI Drive Controller is the priciest of the products reviewed here. It sells for a meaty \$1,099 with 512K of VRAM and \$1,494 with 2MB of VRAM.

The Wyse WY-951 is actually a modified UltraStor Ultra 22C caching controller, developed by UltraStor Corp., that was tweaked to offer some proprietary enhancements when used in a computer from Wyse Technology. (The Ultra 22C is a common OEM product that UltraStor will no longer be marketing directly.)

PROPRIETARY FEATURES

The major enhancement available for Wyse computer users is that a user can run



FACT FILE

UltraStor Corp., 15 Hammond, #310, Irvine, CA 92718; 714-581-4100

UltraStor Ultra 22CA EISA Caching ESDI Disk Controller

List Price: \$795.

Requires: Compatible EISA computer with ESDI hard disk.

UltraStor Ultra 22F EISA ESDI Disk Controller

List Price: \$595.

Requires: Compatible EISA computer with ESDI hard disk.

In Short: The Ultra 22CA offers good performance, and even with a hardware cache, it is reasonably priced. The UltraStor Ultra 22F EISA ESDI Disk Controller, which uses the same design without hardware caching, offers swift performance when coupled with a software cache; it also has a lower price than its sibling. Both the Ultra 22CA and the Ultra 22F benefit from a simple installation procedure.

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The 101-key keyboard, connected to the CPU by a coiled cord, can be removed from the case.

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The AC-powered T6400 has full desktop expandability, including an IBM-compatible, 16-bit expansion slot.

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with full-size keys and key spacing, separate numeric keypad and eight dedicated cursor control keys, and nestled it into a compact 11.7 lb. package (12.9 lbs. with color screen). Then attached it to the CPU with a coiled cord, so you can remove

it and use it on your lap (or other convenient surface).

Now, having read all of the above, you'd probably welcome more information on the T6400. If so, call us at 1-800-457-7777.

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understand the Toshiba philosophy: that portables are the future of personal computing.

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HARDWARE

EISA ESDI CONTROLLERS

hard disk setup procedures normally performed under EISA's DEBUG using the Wyse Configuration Program.

Unlike the other hardware caching controllers reviewed here, the Wyse WY-951 uses costlier VRAM instead of SIMMs. The board can fit a maximum of 4MB of cache RAM.

It supports two ESDI hard disks with speeds from 10 to 24 megabits per second, offers a 33-megabit burst mode, and al-

lows a choice of mapping 17, 32, or 63 sectors per track. It is powered by a 16-bit CISC processor.

Cache memory is installed on a daughtercard, which means the WY-951 occupies two expansion slots. Another drawback for some users will be the lack of on-board floppy disk drive support. Systems using the WY-951 can tie up three



FACT FILE

Wyse WY-951 EISA Turbo ESDI Drive Controller

Wyse Technology, 3471 N. First St., San Jose, CA 95134-9857; 408-473-1200.

List Price: \$1,494.

Requires: Compatible EISA computer with ESDI hard disk and floppy disk controller.

In Short: The Wyse WY-951 proved to be one of the fastest hardware caching controllers reviewed here, but its space-hogging design and bulky price tag are major drawbacks.

CIRCLE 497 ON READER SERVICE CARD

slots for drive support alone if there is no floppy disk drive controller on the motherboard. That can be a real drawback if you also need to install video, a scanner, I/O ports, and other add-ons.

The WY-951 can be used with another ESDI controller also residing in the system, allowing up to four hard disks. The Wyse card is compatible with DOS, OS/2, NetWare, and SCO, USL, ISC and Microport Unix.

We needed the EISA configuration (CF) program during setup to install the .CFG file. Because our test PC was from Dell and not from Wyse, we had to use DEBUG to access the card's BIOS and set the sectors per track, caching, and other options. We then performed a low-level format.

MARVELOUS MANUAL

The manual, written by Wyse, is one of the best we saw for a controller. Each step is presented with clear explanations, discussion of options, and well-designed charts and illustrations.

We tested the card's performance with a 2MB hardware cache. The WY-951 performed slightly better than the other hardware-caching cards, probably due to the faster throughput of the dual-ported VRAM compared with the slower operation of DRAM SIMMs.

While the Wyse WY-951 EISA Turbo ESDI Drive Controller is a good performer, its high price, use of expensive VRAM, and slot-hungry configuration will limit its wide acceptance by users. ■

James Karney is a frequent contributor to PC Magazine.

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1990, 1991 LAN Times, Readers' Choice

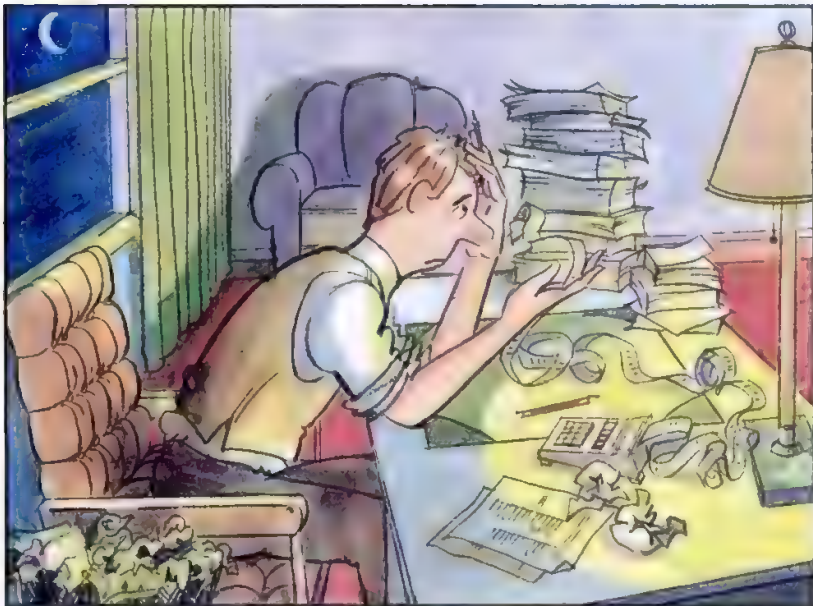
1989 PC Week, "All Around Reliable Choice"

1990 InfoWorld, "Value Leader"

1990 Systems Integration, Product of the Year

1991 Byte Magazine, Best UPS for LANs

CIRCLE 281 ON READER SERVICE CARD



TAX SOFTWARE GETS BETTER WITH AGE

by Gus Venditto and Laura Lou Meadows

If there's a job that makes it worthwhile to have a PC at home, it's the annual tax return. With the right program, much of the anxiety and drudgery of this annual chore will vanish.

Tax programs do more than guarantee your math is correct. They point you to the right forms, explain the IRS's language, and provide auditing features that will flag potential problem spots.

The best tax preparation programs can shave hours from the job; a badly designed program can require hours of extra effort before you feel comfortable, and it can lead you into time-wasting mistakes.

In the seven programs reviewed here, AM Software's *AM-Tax Personal-2*, MECA Software's *Andrew Tobias' TaxCut 1040*, Timeworks's *EasyTax*, Simon and Schuster Software's *J.K. Lasser's Your Income Tax Software*, Parsons

As you spread your tax forms out on the desk this year, leave some room for your PC. The best of this season's tax preparation programs are well prepared to guide you through the tangle.

Technology's *Personal Tax Edge*, DacEasy's *RapidTax*, and ChipSoft's *TurboTax for DOS*, each change to an entry on a form or schedule—whether you're adding a new deduction or changing the amount of a dividend—is calculated instantly. Every confusing term can be explained when you ask for help, and explanations can be linked to the exact line where it's reported to the IRS.

The better programs use a design that resembles the IRS forms, employ easy-to-remember shortcut keys that help you quickly jump from one form to another, and are controlled by a menu system that helps you stay organized. As a result, you can become productive within minutes.

On the other hand, if the program you're using requires many steps for each task, you'll spend hours learning the program before you reap any benefits. Some programs, in fact, may lead you down the wrong path, suggesting that you complete forms that aren't appropriate.

THE INTERVIEW PROCESS

The innovation with the greatest impact on this year's tax software is the Interview feature. Six out of the seven programs reviewed here provide one. An Interview is always optional. It's a series of questions that will cut down on the amount of time you spend moving from form to form, since each of your answers is routed by the program to the correct form or schedule.

A typical Interview begins by capturing basic data—social security numbers, filing status, W-2 form withholding information—and inserting it into the proper forms and schedules. The questions become increasingly complex as the Interview determines which forms you'll need to file.

If your tax situation is complex, the Interview saves time because it begins work on all of the forms you'll need to file. And it may save you money, because it can alert you to deductions you may not be aware of.

If you sit down with all your receipts and withholding forms, the Interview will probably have your taxes finished in record time. Many people will find that the it virtually completes the process of filling out all forms; you'll hardly have to look at tax forms, until it's time to sign them.

The better tax software programs will help you understand the tax laws as you answer the questions. In other programs, answering the Interview is little better

The IRS recognizes
that tax returns
prepared by computers
generate fewer errors.

than going through the form, line by line, on your own.

It's clear that many users rely on their software for accurate tax advice. While some people may use the tax software to begin the filing process and then turn over their work to a professional accountant, many do not. When we polled PC MagNet callers about tax software, 59 percent of the respondents who use a tax program said they did not have an accountant review their return.

That does not mean you should trust your return completely to the advice in these programs. The decision on whether or not to declare a certain deduction, depreciate certain assets, or how to plan your investments for the future, are all beyond the scope of these programs. You may find that the smartest strategy is to prepare your return at home, and then bring it to an accountant for review.

Some accountants will even take the data files from your software to help speed along the process. Some vendors can refer you to a professional in your area who works with your tax program.

LAST YEAR'S DATA

Because the programs read last year's data files, if you stay with the same program, you'll start out with a small portion of the work already done.

Each year, the programs have added the ability to read data from other personal finance managers, such as *Quicken*, *CheckFree* and *Managing Your Money*, so you can try to capture information from your savings and checking accounts. So far, the only combination that provides a truly easy, one-step import is when you're using MECA Software's two programs, *TaxCut 1040* and *Managing Your Money*.

Importing data between other programs usually requires extensive coding of the original data or a lengthy, line-by-line transfer process, where you try to guide the data into the correct entry.

THE EARLY EDITIONS

The IRS has tried its best to help software publishers. They recognize that returns prepared by computers generate fewer errors than those prepared with pencils and calculators.

Part of that effort has been to give approval for the returns printed by software programs. As a result, even though the forms printed by some of these programs don't resemble the IRS forms at all, they will be accepted. However, none of the programs provide IRS-approved forms until the final versions.

Tax programs have their own unique life cycle. The product development and debugging cycle that needs to take place is made painfully short by the IRS. Tax rules are not published until the fall, and they're always subject to revision until December 31. That would give software publishers just about 100 days to program, produce, and market their software.

Instead, publishers create head start editions. They use a combination of last year's tax tables and as many of the rules as are ready in the fall. The head start editions go on sale around Thanksgiving and come with a free upgrade offer to the final edition. By early February, the final version is put in the mail.

The head start edition can be used to project the amount of your refund, help calculate quarterly tax payments, and help plan investments. The better head start versions produce accurate returns; the worst will require that you re-enter all of your data when the final version arrives.

The reviews on the following pages, which were prepared in November and December, were based on head start editions.

WAITING FOR WINDOWS

All of the products reviewed here are DOS programs that can help an individual complete a return. Two of the companies—ChipSoft and MECA Software—offer a Microsoft Windows version. Neither version was available in time to be included in this roundup.

In addition, both companies now sell an EZ version, designed to help taxpayers whose situation is simple enough to be summarized on the 1040-EZ.

IN SUMMARY

While tax preparation software, as a category, has gotten better with each year, there are still areas where it can improve. Printing, for example, is usually far more

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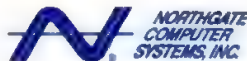


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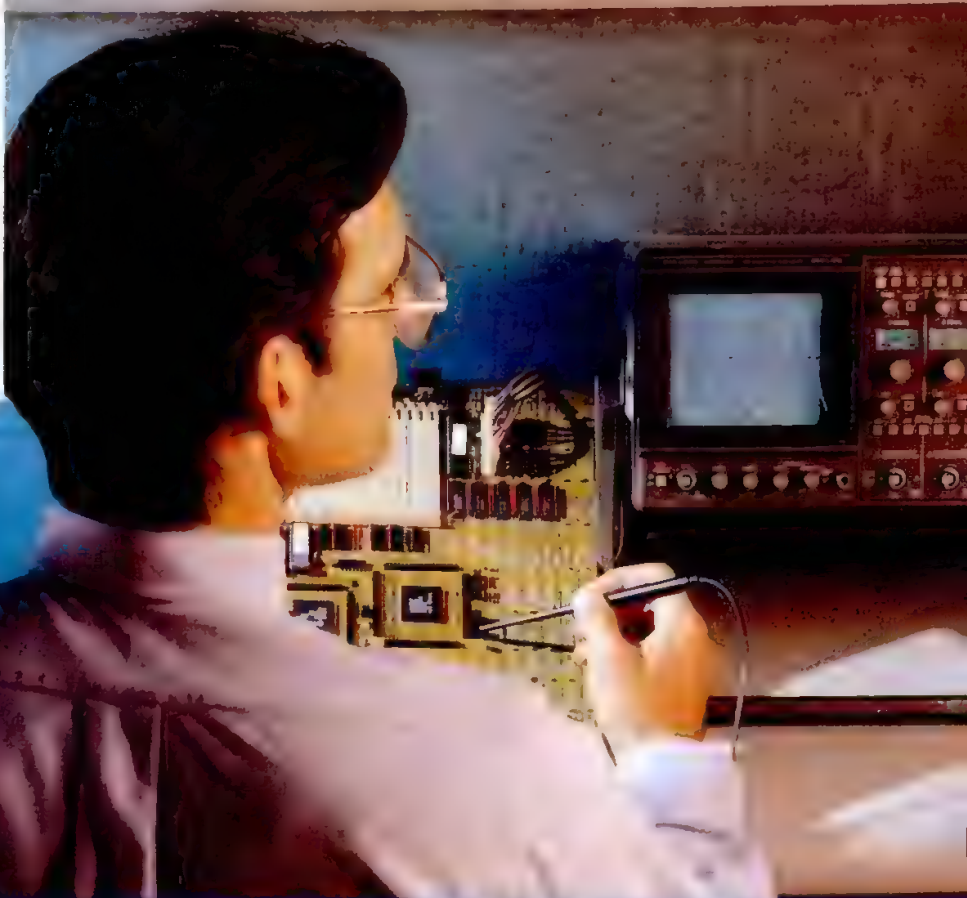
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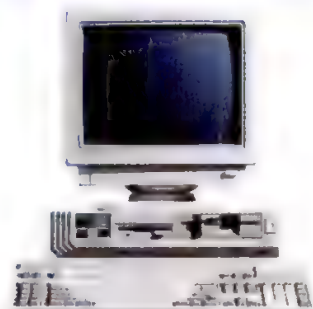


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trouble than it should be. Most programs can print a true facsimile of only the 1040 form; other forms are printed in an IRS-acceptable format, using the printer's default font that many people still don't consider acceptable. In our survey, 20 percent of the respondents said they completed the IRS forms by hand, rather than rely on their program's crude approximation of the original.

Laser printer soft fonts that generate returns which resemble the IRS forms are only available with two of the programs (*TaxCut 1040* and *TurboTax Personal 1040*); some of the programs sell the fonts for an additional charge.

Many of the programs need to improve the clarity of their help systems. Some programs rely on the IRS's own language to explain the tax rules, other programs use clear, easy-to-understand language. But in trying to deal with dual help

SOFTWARE TAX SOFTWARE

systems—one for using the product, and another for filing your taxes—it's easy to become confused and aggravated.

The better products have none of these problems. They're like a combination of a good book and a good program: They provide lucid explanations, sound advice, and then do the work for you. Regular users of tax software have been rewarded by steady improvements each year. This year is no exception.

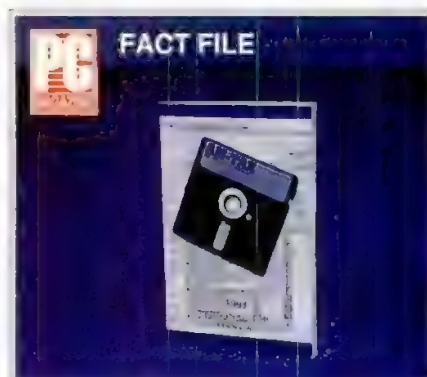
AM-TAX PERSONAL-2

All reviews written by Laura Lou Meadows

If you've been using tax preparation programs for several years, a trial run with *AM-Tax Personal-2* will seem like a journey back in time. Like the little engine that could, *AM-Tax's* personal tax return software packs an entire program onto two 360K floppy disks, will run in 340K of RAM, but does not need a hard disk.

With such economy of code, you do give up many memory-hungry features like an initial Interview feature, a tutorial, on-screen tax help, auditors, planners, and other bells and whistles. What's left is a basic tax package with a pop-up calculator that supports 52 IRS forms and schedules.

AM-Tax did a respectable job with both our simple and complex test scenarios. The depreciation worksheet asks the



AM-Tax Personal-2

AM Software Inc., 1500B N.W. Vivion Rd., Kansas City, MO 64118; 816-426-8361.

List Price: \$65; State programs, \$30.

Requires: 340K RAM, 760K hard disk space, DOS 2.0 or later.

In Short: *AM-Tax Personal-2* is a good program for systems with limited RAM and no hard disk. If you have a more powerful system, you can do better.

CIRCLE 594 ON READER SERVICE CARD



EDITORS' CHOICE

- Andrew Tobias' *TaxCut 1040*
- *TurboTax* for DOS

For the second year in a row, these two tax-preparation programs are clearly superior to everything else. Both are equally adept at handling all types of tax returns. They performed the computations for depreciation and passive loss with grace; others here stumbled over these technicalities.

Andrew Tobias' *TaxCut 1040* provides a sophisticated level of tax advice that guides you through your return, answering questions at the same time that it points you to the right forms. If you have never used a tax-preparation program or if you would like some help with tax strategy, this is the product to try.

TurboTax for DOS has been the market leader for years, and each year, it has added something new. This year, its Interview feature comes close to the type of advice found in *TaxCut 1040*, without sacrificing either the speed or lean design that have made *TurboTax* a favorite. If you are familiar with *TurboTax*, there is no reason to switch; if you favor programs with a lean program design, you will prefer *TurboTax* to *TaxCut 1040*.



Am-Tax Personal-2 is short on amenities, but it gets the basics right, including this depreciation worksheet.

right questions and carries the results over to the proper places. The K-1 worksheet handles the passive loss limitation, but leaves it up to the user to know where to put dividends that flow through from our scenario's partnership.

Unlike Parsons Technology's *Personal Tax Edge*, which at least makes some effort to catch up to the competition, *AM-Tax* seems to pride itself on giving no substantive tax help, auditing, error-checking, or tutorial. You can't scroll through a form from one screen to the next, but you use PgUp or PgDn to jump from one group of lines to the other.

There were some important differences

between what appeared on-screen and what printed out. For example, *AM-Tax* has 67 lines on its 1040 Form instead of the correct 65 lines; this may be a problem that will be cleared up in the final version, but it did not show up on any of the other head start versions reviewed here.

On either a dot matrix or a laser printer, *AM-Tax* will produce an IRS-approved graphics

copy of the 1040 or 1040A Forms with only slightly shaggy edges on the large letters and the usual typeface printouts of the supporting schedules. If you have a laser printer with a tax font cartridge, the

SOFTWARE

TAX SOFTWARE

1040 will look a lot like the professional ones.

AM-Tax Personal-2 may be ideal for someone with an under-powered system, but if you've got more horsepower, you can do better.

ANDREW TOBIAS' TAXCUT 1040

MECA Software's *Andrew Tobias' TaxCut 1040* has carved out a unique place for itself among tax return preparation programs. It is the only program with an Expert Advisor that will take you by the hand, lead you through each step of a tax issue, ask you about one element at a time, clearly define each term when you want, absorb your responses, and give you an answer tailored to your own facts.

It's not really artificial intelligence since the analysis was prepared by Dan Caine, a flesh-and-blood tax lawyer. He lays out the basic tax rules, keeping tabs on each year's tax developments, and making sure it's all understandable to users.

If you take advantage of the Interview feature, you will find a more patient, logical, and witty voice than anybody has a right to expect in a tax program. When I entered in the salary of \$150,000 from our

complex scenario, the screen cheered me on with, "Wow! With a W-2 wage of \$150,000, you're among the highest paid people in America. I know, I know: The guy down the hall makes even more than you do. But you're doing pretty well as far as I'm concerned."

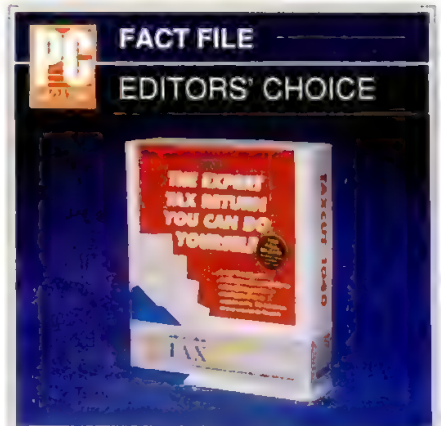
Despite its friendly approach, *TaxCut 1040* does a serious job with such technically advanced tax subjects as depreciation and it asks all the right questions, automatically applies the limitations, and explains all of the terms you have the fortitude to read. It also handles passive activities and underpayment penalties, but best of all is that you can back up in the Interview and change your answers.

If the Interview feature doesn't take care of everything for you, it is a simple matter to go directly to the worksheet, form, or schedule you choose from the Forms menu. Once you've opened a form, you can select the Topics Index to show you all the specific places where there is an Expert Advisor to guide you if you didn't go through the initial interview.

Other features available from the top of the screen menu include the original Shoebox that presents a list of tax items you might have (a W-2, a 1099 DIV, a receipt for real estate taxes) and tells you where they go on the forms. There is a general context-sensitive help key, an IRS instruction form, windows that explain

where a protected number comes from, and a scratch pad that adds up the numbers on detailed supporting lists. *TaxCut 1040* contains a helpful "Where Am I Now?" scrollable screen with a diagram showing the flow of information from subsidiary forms up to the 1040 Form, an electronic memo pad for comments, and the usual pop-up Calculator as standard features.

Importing tax numbers from MECA's companion program, *Managing Your Money*, can be done for nearly the whole return in one keystroke. *TaxCut 1040* can also import figures from spreadsheets and other financial management programs (including *Microsoft Money* and *CheckFree*), but the feature was not yet working in the early release.



Andrew Tobias' TaxCut 1040
MECA Software Inc., 55 Walls Dr., Fairfield, CT 06430-0912; 800-288-6322.
List Price: \$89.95; State programs, \$39.95.
Requires: 512K RAM, 2.5MB hard disk space, DOS 2.0 or later. Full mouse support.
In Short: *Andrew Tobias' TaxCut 1040* features a wonderful combination of clear tax advice and preparation help for even the most complex return.

CIRCLE 805 ON READER SERVICE CARD

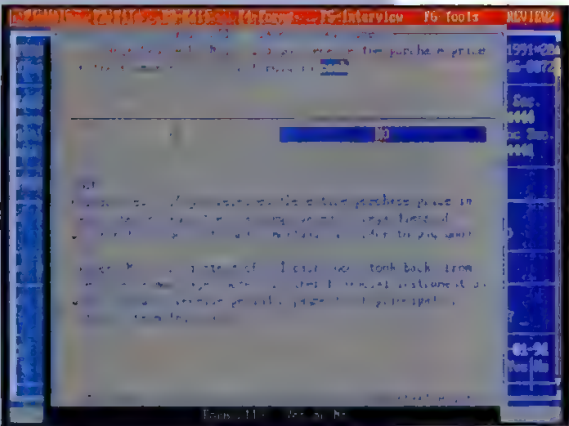
On our scenarios, *TaxCut 1040* came through in fine style. Don't be misled by the Expert's easy, low-keyed tone; its results are technically sophisticated. In the further reaches of depreciation and passive activity loss limitations, it has powerful capacities.

TaxCut 1040 has laser printer support in all of its packages. The downloadable soft fonts in the Laser Link Basic-Pak, which is included in the price of the regular *TaxCut 1040* package, will produce professional quality replicas of 16 key IRS forms and schedules. The rest of the forms will print in ordinary typeface, unless you spring for the \$99 Laser Link Full-Pak to have the remaining forms printed as professional replicas.

TaxCut 1040 is the only program we reviewed that adds bold print headings to the dot matrix printout and won IRS approval to file its ordinary typeface 1040 Form.

Electronic filing is supported through Universal Tax Systems for \$19.95 for each return. There are 13 compatible state programs available for \$39.95 each.

In case you are a tad reluctant to trust your return to a computer, *TaxCut 1040* is the only program that puts its money where its mouth is. MECA guarantees the accuracy of the *TaxCut 1040* calculations with a promise to pay the penalty if the IRS makes you pay one because the program miscalculated. For the layman who is not



Andrew Tobias' TaxCut 1040 excels at providing clear, useful advice; this screen helps report the sale of a home. The help screens found in this program are not as lengthy as those found in other programs, but they usually provide exactly the right information.

Do You Make These Six Common Mistakes On Your Taxes?

Six common mistakes can cause you big headaches on your taxes. An oversight here, an omission there. From unnecessary tax payments to full blown IRS audits -- you can end up paying too much ... or worse.

But now, using TurboTax and your personal computer, you can avoid these simple but costly mistakes:

1 The Arithmetic Error

Today, even the simplest forms contain complex calculations. And with all the late-night scrambling, an innocent mistake could cost you plenty.

2 The Transcription Error

With all those numbers being juggled from schedule to schedule, it's no wonder the figures are so often transcribed incorrectly or entered on the wrong line.

3 The Omitted Form

Even "ordinary" returns require anywhere from six to a dozen forms to complete. It's easy to miss one ... or end up rushing all over town to find the one you need.

4 The Misinterpreted Instruction

At best, IRS instructions can be tough to understand. At worst they can be mind-boggling. What you need are clear directions in plain English.

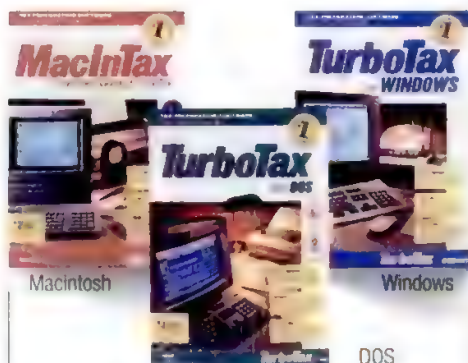
5 The Overlooked Deduction

You'd have to be a professional tax preparer to know all the deductions you're entitled to. If you miss just one, it could cost you hundreds of dollars.

6 The Exceeded Guideline

The fastest way to trigger an IRS audit is to exceed the "normal" range on one of your deductions. You need to know what the IRS looks for on a line-by-line basis.

When you do your taxes with TurboTax, mistakes like these are virtually impossible. And filing your taxes couldn't be easier.



America's #1 Tax Software

TurboTax is America's #1 best-selling tax software -- over six million returns were filed with TurboTax last year! With TurboTax on your PC (or MacinTax on your Macintosh), you can completely and accurately prepare your income taxes in just a few hours.

Here's how easy it is!

- Gather your records and receipts.
- Enter your data into TurboTax just once.
- Print out, sign and drop in the mail.

TurboTax does the rest. Even if your records and receipts aren't in any particular order, TurboTax guides you through step-by-step

questions and shows how to enter every item. And like a good tax advisor, TurboTax helps you identify every deduction you can claim.

Then TurboTax makes all the calculations, checks for accuracy and consistency, and transfers every number to the proper lines on the proper forms. And, TurboTax prints every form you need in IRS-approved format right on your own printer -- ready to sign and mail (or file electronically, if you prefer, for a faster refund).

PC Magazine says TurboTax "makes doing your taxes almost fun." Try it for yourself. Free. We know that if you try it, you'll never go back to doing your taxes the old-fashioned way. So we'll send you TurboTax on an unconditional free trial basis: *If you don't like it, you don't pay for it!*

Free Bonus!

Plus, when you buy TurboTax, we'll send you a FREE copy of The Norton Utilities 6.0 LTE

(excludes NDOS and Disk Editor features) as a special free bonus. The Norton Utilities is America's best-selling disk repair/data recovery program. It performs the most extensive diagnosis and repair of any utility program for the PC and Macintosh. And it's yours free when you buy TurboTax or MacinTax.

THE NORTON UTILITIES

☐ Yes, I'll try TurboTax FREE!

ChipSoft

Rush me a FREE trial copy of TurboTax ASAP (I pay just \$8.50 shipping now). I'll try it free for 30 days, and if I don't like it for any reason, I'll just send it back and owe nothing. If I do keep it, I won't be charged until after my 30-day free trial.

Please Choose: ☐ TurboTax (IBM-compatible) \$69

☐ 3-1/2" disks, or ☐ TurboTax for Windows \$79

☐ 5-1/4" disks ☐ MacinTax (for Macintosh) \$79

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Card # _____

Exp. Date _____

Signature _____

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800-487-8297 ext. 766

TurboTax requires IBM PC XT AT PS/1 PS/2 or compatible, DOS 2.0 or higher, 512K RAM, hard drive. TurboTax for Windows requires Windows 3.0 or higher, hard drive. MacinTax requires Macintosh Plus System 4 or higher, hard drive. Amiga and other non-PC systems may require additional hardware. TurboTax and MacinTax are registered trademarks of ChipSoft, Inc. and ChipSoft CA, Corp. The Norton Utilities is a trademark of Symantec Corporation.

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CHIPSOFT TURBOTAX

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CIRCLE 237 ON READER SERVICE CARD

a tax specialist, *Andrew Tobias' TaxCut 1040* is the program of choice. The excellent advice is clear, comforting, and sound.

EASYTAX

Much improved and all dressed up with a new name, *EasyTax* from Timeworks takes over where *Swiftax*, a product from the same publisher, left off last year. If imitation is the sincerest form of flattery, then *EasyTax* is complimentary indeed.

In a burst of competitive spirit, the program appears on-screen looking as if its makers corralled the market's best tax programs and picked the snazziest features from each one to power their new streamlined model—ah, free enterprise. The company does deserve credit, since it added a few new flourishes that puts *EasyTax* ahead in a number of ways.

Most striking was the easy-to-use interface. You can get to most of the features from menus or key combinations that are kept on display at the top or bottom lines of the screen, and you seldom have to guess about which key or combination will take you where you need to go.

A status line below the on-screen tax forms keeps you posted about which form or schedule you're linked to and states the cross-reference to the source of a number if the cursor is on a protected field; it

SOFTWARE TAX SOFTWARE

displays the message "Input: Number" when the program expects you to enter a number.

A batch of helpful features is available to help you decide how to deal with your tax information. If you go through the interview first, *EasyTax* displays the list of forms and schedules your situation requires. The Tax Preparation Checklist and the Alphabetical Help are some of the most lucid and pertinent in all the programs reviewed here.

The Shoebox function opens a window of over a hundred tax categories. Selecting one takes you directly to the form, and often to the precise line where you enter that information. The Locate Tax Categories utility has over 400 categories of tax data (Form 1099 INT showing interest you received, for instance) and will match that to the place where it should be entered (Schedule B).

At any point, you can call up Tax Tips, organized by schedules and forms, and read excellent advice on "60 of the most overlooked deductions." Year End Tax Strategies gives you small morsels of clear and useful tax-saving advice to use before the tax year closes.

While you're working on a form or schedule, you can track the flow of information to and from that form with the Tax Information Flow Chart, a dazzling display of boxes and lines with moving arrows to show how the program moves in-

formation from one form to the next. There are nice touches like a window that lists all of the business codes you need to choose for a Schedule C proprietorship. When you think you're done, there is a Data Integrity Check that picks up mathematical inconsistencies and obvious omissions.

Unfortunately, our early bird version of *EasyTax* still had many

of the old 1990 forms, without such 1991 changes as the limitation on personal exemptions and personal deductions for high income tax payers, so our scenarios did not produce returns with the expected results. For example, if you enter the correct social security tax withholding at high incomes based on 1991 rates, the

program would erroneously report that you're entitled to a large credit. The depreciation worksheet uses a questionnaire to help you through this complicated topic and it's excellent.

Unfortunately, the K-1 worksheet in *EasyTax* was not up to handling our advanced tax scenario. There was no place to reflect our tax shelter's combination of

HOW WE TESTED: Tax Software

The seven tax-preparation programs in this review were tested by a tax attorney who prepared returns for two households, using a simple and a complex scenario.

The simple scenario is the return for a family of four with two wage earners and two children; their entire income of \$15,000 was reported on W-2 forms. One of the children was born during the tax year and child-care expenses were incurred by the other child. Programs that successfully complete this scenario will create a return that claims a refund using the earned-income and child-care credits.

The more complex scenario is the return for a married couple where one person has taxable wages of \$150,000 and the other is a self-employed consultant with a gross income of \$25,000. The couple has tax-exempt bonds and substantial interest income. The return includes deductions for real-estate taxes and mortgage interest. Complications include the sale of a home, at a substantial profit, and income from a rental property. Business expenses include depreciation of a car and entertainment expenses.

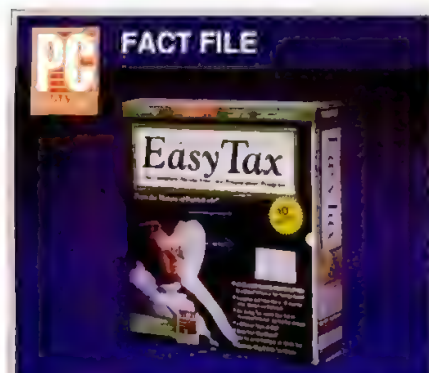
The second scenario is designed to check for accurate calculation of the alternative minimum tax (Form 6251), the self-employment tax (Schedule SE), and the underpayment penalty (Form 2210). To successfully complete the testing, the tax program should also correctly limit the following: personal deductions claimed (Form 1040, line 36), passive activity loss (Form 8582), and itemized deductions (Schedule A, line 26). ■

Line	Description	Amount
1	Wages, salaries, tips, etc.	7
2	Taxable interest income (Sch B if over \$400)	9
3	Dividend income (Sch B if over \$400)	9
4	Taxable refunds of state and local income taxes	10
5	Alimony received	11
6	Business income or (loss) (Sch C)	12
7	Capital gains or (loss) (Sch D)	13

EasyTax is good at showing you how an entry is linked with another item. For example, in Form 1040 the status bar for line 12 (Business Income) indicates that this information is linked with Schedule C.

a large, passive real estate loss and a smaller passive rental profit, fouling up the passive-loss limitation computation.

EasyTax will pick up data from financial management programs such as Intuit's *Quicken*, Monogram Software's *Dollars*



EasyTax

Timeworks Inc., 625 Academy Dr., Northbrook, IL 60062; 800-323-7744, 708-559-1300.

List Price: \$79.95; State programs, \$39.95.

Requires: 512K RAM, 1.5MB hard disk space, DOS 2.1 or later. Full mouse support.

In Short: The very good interface design of *EasyTax* is marred by some errors, which may be fixed in the final version.

CIRCLE 506 ON READER SERVICE CARD

SOFTWARE TAX SOFTWARE

& *Sense*, and MECA Software's *Managing Your Money*, as well as from Lotus 1-2-3 and ASCII files, although you'll need to spend some time on the process. You can feed *EasyTax* one number at a time from a file (which the program calls *interfacing*) or you can code each item of data in the data file then bring it all in and disperse it to the correct forms and schedules in one operation.

The graphics printing mode that promises a replica of the IRS forms 1040, 1040A, or 1040EZ was not in our early bird edition, but the plain text printout of the 1040 and supporting schedules worked just fine.

For \$20, electronic filing is supported by modem and mail through TenKey Publishing. Twenty-four state programs are available at a list price of \$39.95 each.

EasyTax is making some strong advances in interfaces and is arguably the best designed program in this roundup; unfortunately, the early version produced misleading results. The final version should correct these problems, but next year, Timeworks may want to wait until it has updated its support for tax law changes before releasing the early version to its users.

J.K.LASSER'S YOUR INCOME TAX SOFTWARE

One of the most attractive features of Simon and Schuster Software's *J.K. Lasser's Your Income Tax Software* is the thick soft-cover book packaged with it. The book, *J.K. Lasser's Your Income Tax 1992*, is a best-seller that carries a \$14 list price. The combination of the software with nearly 500 pages of time-tested and thorough tax help is especially reassuring for those who rejoice at the sight of confirmation from the printed page.

The program's tax help is not limited to the book; there are useful pop-up windows that help in using the program and that answer tax questions.

With color coding that helps you follow the cursor and differentiate the function of the moment from what to do next, the program's design concentrates on being easy to learn. The separate User's Manual for the software is a model of clarity, with many illustrations of the screen to go with the step described.

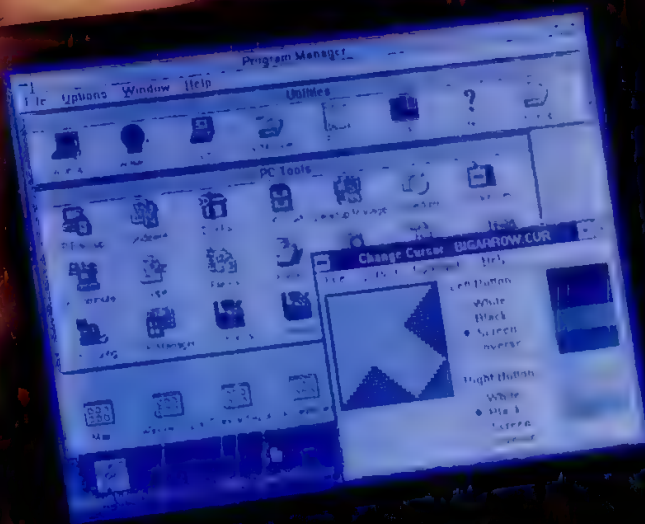
Lasser starts off by giving you a chance to complete an interview that guides you through the entry of basic data and determines which forms you need to file. (If

TAX SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

☒ — Editors' Choice
☒ — Yes ☐ — No

	AM-Tax Personal-2	Andrew Tobias' TaxCut 1040	EasyTax	J.K. Lasser's Your Income Tax Software	Personal Tax Edge	RapidTax	TurboTax for DOS
List price	\$65.00	\$89.95	\$79.95	\$74.95	\$49.00	\$49.95	\$79.95
SOFTWARE FEATURES							
Pop-up calculator	☒	☒	☒	☒	☒	☒	☒
Built-in notepad	☒	☒	☒	☒	☒	☒	☒
Financial amortizer	☒	☒	☒	☒	☒	☒	☒
Context-sensitive help	☒	☒	☒	☒	☒	☒	☒
FORMS PREPARATION							
Number of forms and schedules	52	57	51	51	29	35	51
Number of optional state programs	18	13	24	24	41	24	44
TAX HELP							
Interview feature	☒	☒	☒	☒	☒	☒	☒
On-line tax advice	☒	☒	☒	☒	☒	☒	☒
On-line IRS instruction	☒	☒	☒	☒	☒	☒	☒
Tax planning	☒	☒	☒	☒	☒	☒	☒
Audits final return	☒	☒	☒	☒	☒	☒	☒
MISCELLANEOUS							
Microsoft Windows version	☐	☒	☒	☒	☒	☒	☒
Electronic filing	☐	☒	☒	☒	☒	☒	☒
Imports data from other financial programs	☐	☒	☒	☒	☒	☒	☒
Imports ASCII files	☒	☒	☒	☒	☒	☒	☒



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And Battery Pro™. Designed to extend battery life when working in Windows, it suspends functions you're not using while keeping calendars and other background programs current. So you can pick up

where you left off.

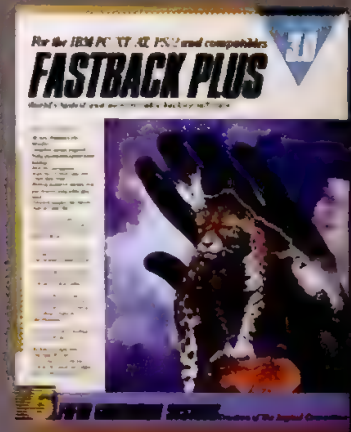
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Everyone who uses a PC ought to back up regularly. But most people don't back up at all.

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Now you can set up fully automatic, unattended backups for every PC in the house.

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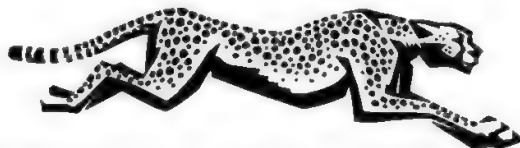
We wouldn't recommend trying this test yourself. But if you insist, you'll be glad to know that Fastback Plus is backed up by our vaunted 24-hour toll-free technical support and a one-year money-back guarantee.

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And tell everyone to stand back.



If automated, unattended backups aren't your style, you can still enjoy unprecedented convenience with our new Express Menu, which InfoWorld considers "only slightly more complicated than an on/off switch."



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MBargain.



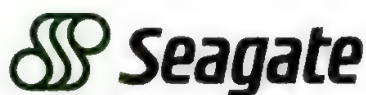
Once again, Seagate is giving you more bytes for your buck... with the first low-profile 3.5-inch drive to offer more than 100 MB in the same price category as 80 MB drives.

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The first name in disc drives

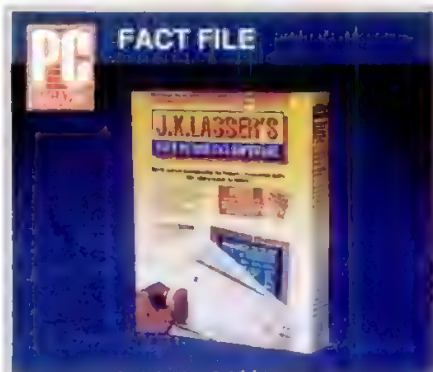
you decline to be interviewed, you can go directly to the input worksheets and forms and gets started.)

It's a good idea to take the interview, since after you finish, you'll see a window with a printable list of the forms you need to fill out. Being able to print this list is a nice touch not found in other programs with interviews.

Next, choose the forms you need from the Forms menu and fill in the rest of your data. Along the way, you'll probably encounter some protected fields that ask you to go to a supporting schedule or tell you that the program will calculate the number. You can override these when circumstances warrant.

Lasser performed very well on our simple test scenario; it properly calculated the three elements of earned income credit. On our complex scenario, the depreciation questionnaire was a breeze to use. The program dealt smoothly with the limits for an automobile's first year depreciation and Section 179 deductions. However, it did not have the capacity to deal with our partnership income that included both a passive real-estate loss and passive rental profit on the K-1 worksheet.

The program has an audit feature to check for obvious omissions and inconsistencies, but its mathematics were dubious (it complained about the zero overpayment figure when it was dealing with a balance due return), and the observations on tax advice were not really on target. The *Lasser* package insert says



J.K. Lasser's Your Income Tax Software
Simon & Schuster Software, 15 Columbus Circle, New York, NY 10023; 800-825-7638.
List Price: \$74.95; State programs, \$29.95.
Requires: 512K RAM, 3.5MB hard disk space (5MB recommended for installation), DOS 3.0 or later.
In Short: J.K. Lasser's Your Income Tax Software's best feature is the comprehensive tax manual included with the purchase price.

CIRCLE 907 ON READER SERVICE CARD

"all calculations have been verified by an independent accounting firm and are guaranteed by J. K. Lasser."

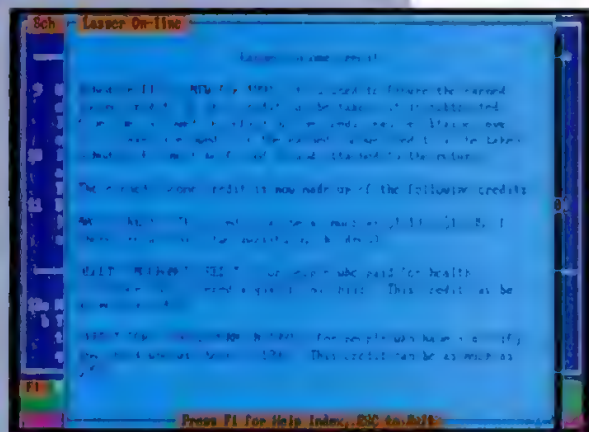
Lasser has a host of other goodies, including importing whole files of financial and tax data from *Quicken* or *Pacioli 2000*, electronic filing by modem or mail, comparison of the tax cost of a married couple filing jointly, a separate loan amortizer, and six free weeks of *Barron's National Business and Financial Weekly*. Twenty-five compatible state programs

will pick up all the pertinent entries from your federal return file.

Most of the spiffy dot matrix graphics and laser features were not available in our early copy, so we checked the accuracy of our results with the transparency or overlay options. *Lasser* promises replicas of the essential IRS forms if you buy \$39.95 of soft fonts or the much more expensive Center Piece

Tax and Accounting font cartridge.

J.K. Lasser's Your Income Tax Software is a good value if you don't have sophisticated investments and would like to have the comprehensive J.K. Lasser book.



J.K. Lasser's Your Income Tax Software provides well-detailed explanations of tax rules. Here it shows background information on the Earned Income Credit.

PERSONAL TAX EDGE

The new and improved *Personal Tax Edge*, from Parsons Technology, is a serviceable basic program available through direct mail at a list price of \$49. For your money, you get a program that does the essentials for a less-complicated return.

Personal Tax Edge installs without fuss and starts you off on the right foot with an Interview that figures out which forms you're required to file. With your answers to the interview questions in hand, *Personal Tax Edge* shows you a list of necessary forms and schedules, and at your request, gives you a printout so you can keep track of how you are doing as you complete each one. If you prefer to tackle the forms immediately, the option is also available.

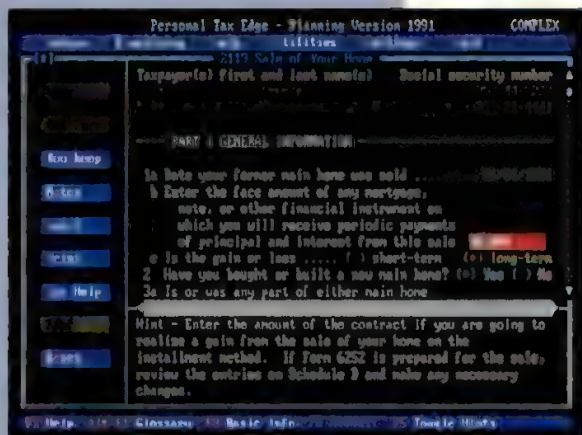
This year, as you make your entries, *Personal Tax Edge* speedily and automatically recalculates and carries over the results without waiting for a separate command. There are a variety of ways to ask for on-screen help, including an F5 toggle to turn a Hints window on and off. When you're finished, the audit feature will check the tax results.

Personal Tax Edge specifies system requirements of 640K RAM. If your drivers and TSRs take up more than 90 K, you are likely to run into situations where some of the help features are disabled in order to run the program's essentials. This



Personal Tax Edge
Parsons Technology Inc., One Parsons Dr., Hiawatha, IO 52233; 800-223-6925.
List Price: \$49. State programs, \$49.
Requires: 640K RAM, 3.5MB hard disk space (5MB RAM recommended for installation), DOS 2.11 or later. Full mouse support.
In Short: With its low price, *Personal Tax Edge* is a good value for simple returns, but it may have difficulty with a sophisticated scenario.

CIRCLE 908 ON READER SERVICE CARD



While you are filling in Form 2119 for the installment sale of your home, *Personal Tax Edge* lets you toggle between hints on how to complete the related Form 6252 and Schedule D.

happened when we ran our complex test scenario and got to the point of using the Depreciation Calculator. The Tax Help feature (Alt-T) and a general F1 help function were both disabled in our early bird version due to memory requirements. Parsons says that support for expanded memory will be added.

On our simple test scenario, *Personal Tax Edge* gave the most detailed results of any package reviewed here on the new earned income credit. The complex scenario stretched the program's capacities a bit too much for the more complicated items.

Although only the text-printing mode was available in our early bird program, *Personal Tax Edge* promises a graphics 1040 and 1040A capacity for the final edition.

Personal Tax Edge supports electronic filing through Parsons Technology at prices starting at \$19 per return and decreasing to \$10 each for filers of more than 50 returns. Although no state programs were available last year, Parsons tells us that they will publish 41 compatible state tax return programs this year.

RAPIDTAX

RapidTax, from DacEasy, starts off with great color screens that let you see the pattern of information going into this

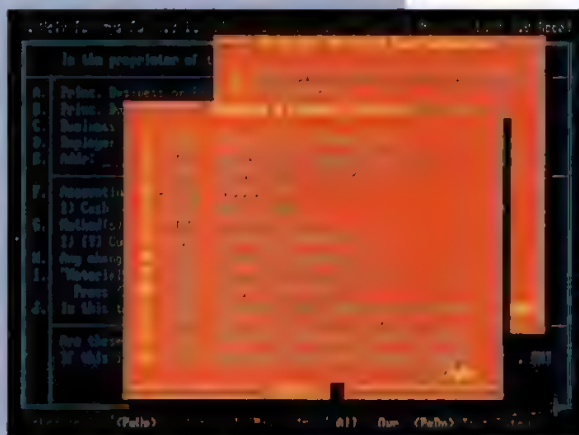
program. *RapidTax* provides support for a wide range of forms and schedules, many with detailed worksheets.

If you want to go through an interview, you need to summon the Forms menu first and locate the Interview feature. One of the best *RapidTax* features is the frequent availability of a Look-Up window that presents a multiple-

choice list of tax categories so you can highlight your answer, press Enter and have the program insert your choice. This is especially welcome in cases where choices may be more technical than the average user is familiar with.

There are the usual niceties like a pop-up calculator, operational help screens, and substantive tax help windows, but the quality and quantity of the tax help is meager. The manual also boasts of an audit-risk analysis feature and a completeness report, which were not ready in the early version we reviewed. In fact, many features in our version were not fully functional.

RapidTax's downfall is the complexity of its menu and command structure. Many of the features are invoked with two-key commands that do not reside on-screen or on the main menus. This means



One of *RapidTax*'s best features is a Look-Up window that presents a multiple-choice list of tax categories.



FACT FILE

RapidTax

DacEasy Inc., 17950 Preston Rd., #800, Dallas, TX 75252; 800-322-3279.

List Price: \$49.95; State programs, \$29.95.

Requires: 512K RAM, 4MB hard disk space, DOS 3.1 or later. Full mouse support.

In Short: Pull-down menus that list tax categories are *RapidTax*'s most useful feature. Its design seems aimed at accountants rather than individuals.

CIRCLE 808 ON READER SERVICE CARD

lots of extra trips through the manual or layers of help windows.

With our scenarios, *RapidTax* aced the earned income credit, but faltered at the depreciation computation, the treatment of the passive loss from the investment partnership, and the underpayment penalty calculation. The Depreciation input module was a disappointment on our scenario. It didn't offer a chance to tell enough about our property for the program to limit the Section 179 deduction or to limit the depreciation itself to the IRS maximum of \$2,660 for a car placed in service in 1991. On our test, *RapidTax* did not treat the realty loss and rental income appropriately.

RapidTax has a number of professional features such as client billing, electronic filing with refund anticipation loans, and a batch input mode for data processors to quickly key in information from the input sheets used by a tax professional during customer interviews. It does not import information from financial management programs.

The special print features were not yet ready, but the ordinary typeface printout gives you all the information necessary to copy onto an official IRS 1040 Form and supporting forms and schedules. The laser print feature requires

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Documentation	(75)	Very Good	Good	Very Good	Very Good	Good	Very Good
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Ease of use	(125)	Good	Good	Very Good	Excellent	Good	Good
Error handling	(75)	Good	Good	Satisfactory	Very Good	Good	Very Good
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Support policies	(50)	Good	Good	Very Good	Good	Good	Very Good
Technical support	(50)	Very Good	Very Good	Satisfactory	Excellent	Satisfactory	Very Good
Value	(75)	Satisfactory	Good	Very Good	Excellent	Very Good	Very Good
Final scores		6.0	6.4	7.1	8.7	6.8	7.1

Source: InfoWorld, November 26, 1990

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FontMonger software converts type formats in any direction between PostScript Type 1 and Type 3, Intellifont, Nimbus Q and TrueType (for Windows 3.1). It provides complete CorelDraw!, Micrografix Designer and Adobe Illustrator support for TrueType, since all your converted fonts can be imported or exported as EPS files. You can even generate customized typefaces and characters such as obliques.

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Publisher:
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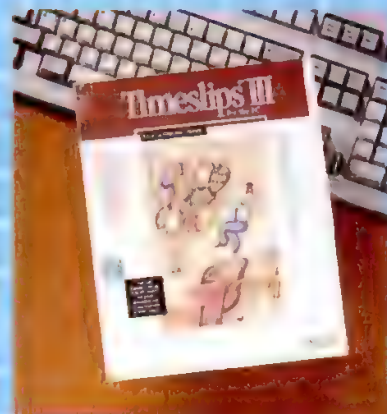
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WristSaver/ WristSaver MousePad

Not just another flat pad! The WristSaver cradles your wrist with a contoured neoprene rubber pad and a nylon covering.

It's ergonomically designed to support your wrist at the proper angle to help avoid the pain associated with Carpal Tunnel Syndrome. The WristSaver MousePad provides a comfortable rest for your wrist, plus a conventional mouse pad. Simple finger movements replace sliding the entire arm or hand. Manufacturer: LB Innovators
WristSaver AC4090 (Red) \$13.
WristSaver MousePad AC4080 (Red) \$13.
(Both available in Red, Grey, Black or Navy)

\$13ea.

Graftek

Graftek analyzes and produces graphs from your data. It performs calculus, statistics, frequency analysis (FFT), transformations and extensive curve fitting. Its library of math and trig functions allows you to define and plot your own functions. Its analysis capabilities include area under a curve, zeros, minima and maxima, inflections, standard deviation, sum, mean, variance, correlation coefficient and more. Graftek has an easy-to-use, full featured Help structure. Requires graphics card and a mouse. Publisher: Artworx BS4094

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★CorelDraw! 2.0

CorelDraw! 2.0 is the PC graphics software for everyone. It's fun and it's powerful, and the winner of over 40 international first place awards! CorelDraw! gives you incredible type control, superb drawing power, and stunning special effects in a value-packed program. It comes with over 150 fully scalable outline fonts (which can be converted for use with Adobe Type Manager); over 4000 clipart images and symbols; dozens of fill patterns, dotted and dashed line styles, and Arrowheads; 31 import/export filters; a free Pantone license; and free utility programs - CorelTRACE, WFNBOSS, and Mosaic. Windows 3.0 or OS/2 required. Also available on CD ROM. Publisher: Corel Systems GR0543/5

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Leading Edge 386/SX 16MHz VGA Complete Color System



Put the Leading Edge VGA Color System to work in your home or office

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Access to help and documentation features are available. The system is easy to use and is a great value for the money. The system is a great value for the money. The system is a great value for the money.

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Publisher: Abracadata
EN2684

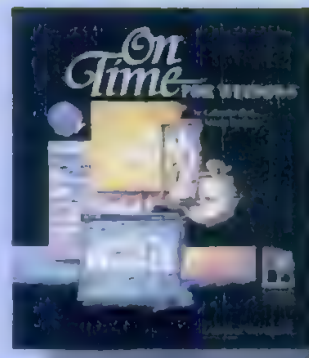


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BS3584

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KX-P1124i

The Panasonic KX-P1124i is a high speed 24 pin printer with the high end features you need. Control all of your printing features, save and recall them for up to four different applications using the EZ Set LCD 16 character operator panel. Other features include: Paper handling capabilities such as rear, bottom, front and top paper feed paths and a push/pull tractor. Offers excellent print quality with 11 resident fonts in 10 different sizes and 360 x 360 dpi resolution. Manufacturer: Panasonic
PR2200

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Publisher: Computer Associates BS5543

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\$134

DesignCAD 2D

PC Magazine Editor's Choice. DesignCAD has many built-in features that the other CAD packages charge extra for, if they have them at all. DesignCAD is easy to use. It has pull-down menus, an on-screen manual, a tutorial, and single keystroke commands. DesignCAD is flexible! It has a programming language, macros, and user-customized icon menus. DesignCAD is powerful! It has extensive drawing and editing tools, dimensioning, area and center of gravity calculations, and more! **Publisher: American Small Business Co. CA0203**



\$175



Crosstalk® Mk4

Crosstalk Mk4 is the winning communications program for power users. When it won "Editor's Choice," PC Magazine called it, "A top-notch program that does almost everything and does it all right." **CM0054 \$150.**

★ Crosstalk for Windows

If you're working in Windows, Crosstalk for Windows keeps you there with full Windows capabilities like multi-tasking. InfoWorld named it "Product of the year." Software Digest called it, "best of the graphical communications packages." **CM0194 \$129.**

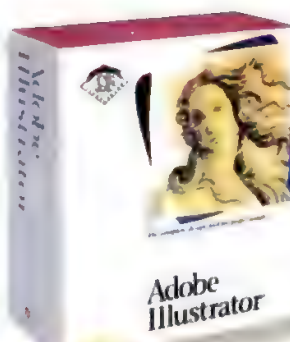
Crosstalk Communicator

For executives and laptop users, Crosstalk Communicator wins with all the popular protocols and emulations! It's fully compatible with Crosstalk Mk4. InfoWorld calls it "an exceptional value." PC World gave it their "Best Buy" award.

Publisher: DCA/Crosstalk Communications

CM0284

\$45



★ Adobe Illustrator 4.0

Adobe Illustrator 4.0 for Windows provides a professional illustration solution for the PC environment. This new version of the program allows graphic artists, designers and desktop publishers to create professional-quality illustration and design. This value packed program includes Adobe Type Manager software (ATM), 40 Adobe Type 1 type faces, the Adobe TypeAlign type manipulation program, Adobe Separator color separation software and a generous selection of Adobe patterns, textures symbols, and borders. Other features include: Edit in preview, On-screen text, Resizable toolbox plus enter and edit text directly on screen. With Adobe Illustrator, users can now freely exchange files between Windows, Macintosh and NeXT desktop platforms. **Publisher: Adobe Systems GR0214**

\$309

386MAX 6

386MAX 6 enhances Windows and supercharges DOS 5! It contains the most advanced suite of memory recovery and optimization tools available. 386MAX features ROMsearch™, which squeezes out every last byte of high DOS memory so more memory is ready to be optimized. VGAswap™ makes more usable high DOS memory available on VGA and EGA systems. With SmartMemory™ there's no need to think about memory. Extended, expanded, VCPI, and DPMI memory are automatically allocated to provide maximum memory for your applications. Integrated features include a graphical user interface, disk cache and system analyzer are seamlessly integrated into 386MAX. **Publisher: Qualitas**

Also available: **BlueMAX 6 1T1673 \$79.**

386MAX 6 1T06N4

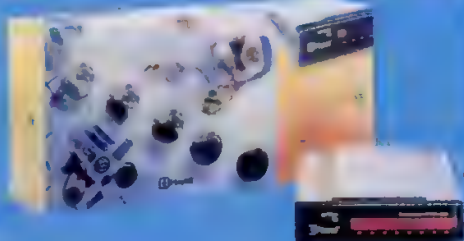
\$65



OPTIMA 96 V.32

Great value! OPTIMA 96 is the affordable choice for high-speed personal communications with information services, bulletin boards, and corporate host computers. OPTIMA 96 provides (CITT V.42) 9600 bps and (CITT V.42bis) for up to 48,000 bps throughput. This external modem supports V.42/MNP 5 error control, 2400, 1200 and 300 bps, and comes with free Smartcom EZ software. OPTIMA 96 can handle asynchronous, synchronous or Hayes Autodivine transmissions and automatic feature negotiation creates the most efficient combination of speed, error control, and data compression. It practically operates on its own! Other special offers included with OPTIMA 96 give you a complete, value packed communications solution.

Manufacturer: Hayes MM0930



\$499



**★ After Dark
for Windows**

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Slide Show style presentations. After Dark provides screen-locking password protection. The SystemIQ task manager maximizes performance while running After Dark. After Dark also features DOS blanking to black, even without windows. **Publisher: Berkeley Systems GR1994**

\$29

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PC Magazine, June 25, 1991

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SWISS NARROW
 (Helv Narrow)
DUTCH (Tms Rmn)
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 ITC AVANT GARDE
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 CENTURY
 SCHOOLBOOK
 ITC ZAPF CHANCERY

ITC Zapf Dingbats
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PostScript file output
from Apple LaserWriter
JNTX

PostScript file output from
LaserJet III with PacificPage XL

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THERE'S MORE THAN ONE WAY TO SATISFY THE IRS

by Lance N. Ulanoff

Beyond the seven software packages examined in the main review, there is an entire spectrum of products. Whether you need help planning your taxable finances in advance, you are looking for ways to produce mailable tax forms at home, or you are searching for an electronic transmission venue, several choices await you. What follows is just a sampling of these products.

SPREADSHEET TEMPLATES

Although not as prevalent in recent years, products that create templates and worksheets of tax returns on PC-based spreadsheet software are still very much a part of the individual income tax software picture.

Heizer Software (800-888-7667) sells a series of income tax spreadsheet modules, called the *Heizer Tax Series*, which can be used with *Microsoft Excel* on the PC. Prices vary from \$19 to \$299, depending on the worksheet ordered.

TaxTime for 1-2-3 from Austin Scientific (800-433-1608) works with *Lotus 1-2-3*, Version 2.01, 2.2, and 2.3, to create tax worksheets that resemble forms and schedules for IRS and state taxes. The base package sells for \$95, with additional federal forms and state packages available.

TAX PLANNING

All too often, tax time is nothing but an endless string of unhappy surprises. As a result, a number of companies have developed tax-planning software, often to complement their tax-preparation packages. As one software vendor put it, "They pick up after Uncle Sam has slammed the door."

Managing Your Money 8.0, a money-management software package from MECA Software (800-288-6322), includes an integrated tax planner. The \$219 package can, with one command, export all of your taxable transactions to MECA's *Andrew Tobias' TaxCut 1040* tax-preparation software.

On the horizon, MECA is introducing *Andrew Tobias' Tax Esti-*

mator. It represents a much more tax-specific planning package that, while not bundled with the type of sophisticated financial-planning tools found in *Managing Your Money*, offers a tax interview instead. Much like the interview process included in a number of the major tax packages, a series of questions in *Tax Estimator* leads to a tax navigator that suggests what forms you will need to use.

Some of the programs reviewed here

With these
products and
services, early
tax planning and
efficient
electronic filing
can be managed
with ease.

have help options for tax planning, but these features are not as extensive as the help in *Managing Your Money*.

TAX FORMS

Most tax software programs offer you the ability to create laser-quality IRS-standard income tax forms, which are almost indiscernible from the real thing. However, these forms can only be produced on laser printers equipped with the proper print cartridges and fonts.

Nelco (414-337-1000) offers a complete line of laser font cartridges and software. Nelco's software is compatible with more than 100 tax preparation and payroll packages and the cartridges work with most HP-compatible laser printers. If you do not own a laser printer, Nelco also provides continuous forms for use with dot matrix printers.

Another alternative is Nelco's transparent overlays. With a tax-preparation program, filing information is printed on a blank sheet. The overlay is then placed on top of the sheet and a photocopy is made for a completed tax-return form. In addition, Nelco provides third-party electronic filing services for professional tax preparers. Prices range widely, but a complete catalog of prices and products can be ordered by calling Nelco.

UDP Data Products (800-888-4413) also offers a complete line of tax font cartridges for use with most non-impact laser printers, such as those sold by IBM, Hewlett-Packard, and Epson America.

ELECTRONIC FILING

Most of the packages reviewed here have entered agreements with a third-party electronic tax filing service. One company, Cox & Associates (305-442-0234), has taken the concept a step further.

Instead of purchasing tax-preparation software and sending a disk to an electronic filing service, you can use Cox & Associates's 900 number to download its *900/taxes* software. This software includes all federal forms, on-line help, and all the necessary worksheets to complete the return. When the form is completed, you upload the results to Cox & Associates.

As with other electronic filing services, *900/taxes* still involves some paperwork. In order to verify your signature, a signed copy of the completed form and an 8453 Signature Validation Form must be mailed to Cox & Associates. When it receives the paperwork, Cox & Associates releases the electronic file to the IRS and mails the paperwork. By the time the service goes on-line, downloading the software costs \$19.95 and Cox & Associates's electronic filing service should run between \$9.95 and \$15.00. Although this process still involves some paperwork, it's clear that the IRS's paper chasing days are numbered. ■

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SOFTWARE

TAX SOFTWARE

a tax font cartridge and the purchase of extra software to replicate the IRS forms.

RapidTax is published by the same company that sells the DacEasy line of accounting software. They seem to be targeting professional accountants with this program.

TURBOTAX FOR DOS

With feedback from nearly half a million users, it's no wonder *TurboTax for DOS*, from ChipSoft, gets better each year. With its Logical First Step and Logical Next Step features, *TurboTax* appears on-screen as a welcome friend radiating confidence and competence.

Its initial interview takes you through its whole drill, then tells you which forms and schedules you will need. It will also stop each time your answer indicates that you need a form and allow you to fill it out and return you to where you left off in the interview. Of course, if you're an old hand at tax forms, you can go directly to filling in the blanks on the personal information worksheet and then move on to the official forms you need.

In addition, you'll find a tutorial covering the program's operation and a host of help features to give you tax advice. This year's expanded help features include a File Cabinet of subjects to take you through key words or phrases that direct you to the pertinent form and an F8 key that pops up a screen of condensed IRS instructions for a particular form or field.

Consult with TurboTax is a feature that offers a general explanation for each form or schedule, what it's for, and how to approach it. The hypertext screens highlight some of the more technical terms, then let you see another screen clarifying the term. Selections from the Personal Tax Issues list give a broader treatment of frequently asked tax questions.

The screen conventions for moving from form to form within a return are perhaps the most efficient of any program reviewed here; the menu bar floats at the top of the screen and most of the specific

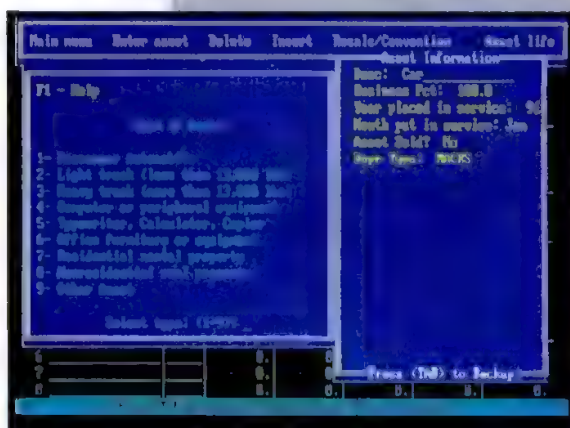
commands are constantly in view on the bottom line. When you're familiar with the shortcut keys, you can turn off the menus and show more of the form.

Our head start version did not contain the earned income credit form for our simple scenario so the results were incomplete.

For the complex scenario, *TurboTax* has one of the most comprehensive and effortless depreciation functions of any program reviewed here. Its series of questions, accessed with a special menu from the depreciation worksheet, can whisk you through in a flash.

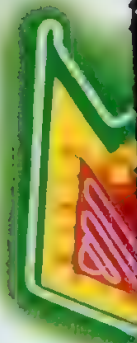
If you're eager to broaden your understanding of the more arcane reaches of depreciation, there are extensive help screens throughout the questionnaire, often with hypertext subcreens for the tough terminology. When we got to the passive items, a real-estate loss, and a rental profit from the limited partnership's K-1, *TurboTax*'s handling was exemplary, correctly generating Form 8582 and the IRS prescribed worksheets with virtually no additional work needed.

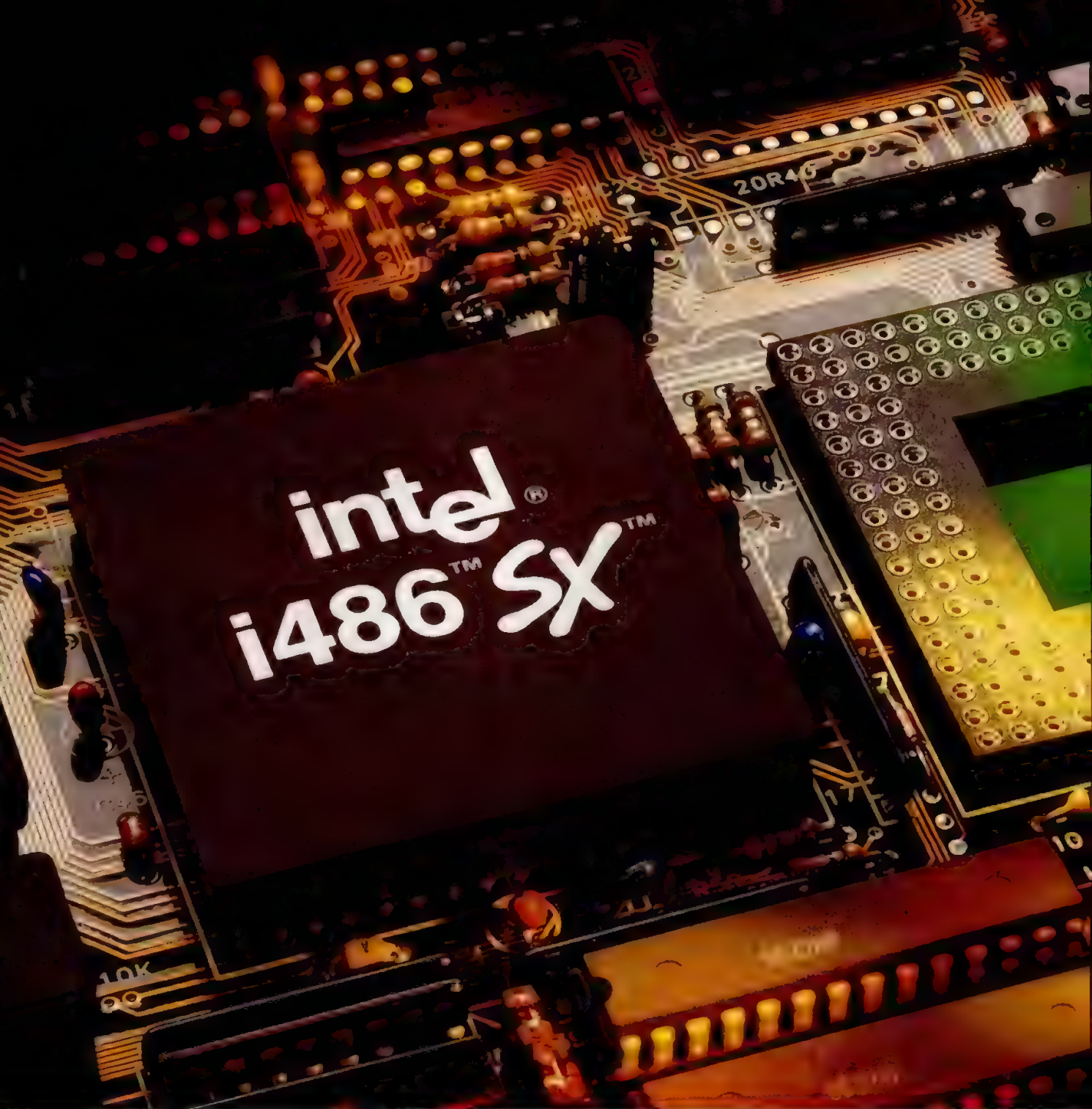
The import feature that can pick up either a whole tax return or one number at a time is highly developed, though it expects you to do a fair amount of work. An appendix is devoted to showing how to code the entries in text files or such financial management programs as *Quicken*, *Microsoft Money*, *CheckFree*, *Parsons Technology's Money Counts* and *Dollars and Sense*.



TurboTax for DOS's depreciation worksheet displays your answers in a window as you go through the series of questions. TurboTax makes it easy to switch among forms by using hotkeys.

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SOFTWARE TAX SOFTWARE

Regular TurboTax
users should be thrilled
with the improvements
made this year.

For example, you'd indicate real-estate taxes with the code =NAAB=. To help with the process, ChipSoft will mail you a copy of Hotlink, a TSR that pops up the codes on top of your data file, letting you paste the code into the document.

After the codes are added to the comment fields in the data files, *TurboTax* will import the entire file, placing the numbers on the correct forms. You may find it's more trouble to code the files as you prepare this year's return, but you'll probably want to use the coding system after your tax return is done so you can capture data for next year's return as you use your financial software.

When you've finished filling in the blanks, the final review feature from the Help menu has five approaches to check the results. The Data Examiner will search out inconsistencies and obvious omissions; List Overrides and Notes shows where you overrode a field so that you can double check your alteration; the U.S. Averages shows you what the 1989 average deductions and other items were by income bracket so you can see how you stack up; and the IRS Audit Flags function points out areas that often precipitate government scrutiny.

If your withholding is less than 90 percent of your tax liability, *TurboTax* has an estimated tax worksheet to calculate each quarter's number that you'll have to write into the estimated tax payment vouchers for 1992, which you order from the IRS. There's a What If menu for displaying different scenarios side-by-side and a Plan mode to run your 1991 figures, or modifications thereof, through the 1992 cost of living adjustments to come out with next year's probable tax bill.

TurboTax comes with a downloadable soft font that will print the 1040 Form (or 1040A or 1040EZ) in a professional black-and-white replica of the IRS form with all of its supporting schedules in IRS-approved, ordinary Courier typeface. For

FACT FILE

EDITORS' CHOICE

TurboTax for DOS
 ChipSoft Inc., 6330 Nancy Ridge Dr., #103,
 San Diego, CA 92121 2246; 619-453-8722
List Price: \$79.95. State programs, \$49.95.
Requires: 512K RAM, 1.5MB hard disk
 space, DOS 2.0 or later. Full mouse support.
In Short: Over the years, *TurboTax* has
 been one of the best-designed, most-
 comprehensive programs available. This year,
 it gets better with a good Interview feature.

CIRCLE 510 ON READER SERVICE CARD

dot matrix printers, *TurboTax*'s graphics capability produces a fairly close approximation of the IRS's 1040 design.

TurboTax can prepare your federal return for electronic filing by modem and mail through Nelco. It also can transfer all your federal data to any of its 43 state programs and be ready to produce your state tax return after a few annotations.

If you haven't used the program in earlier years, you may be disconcerted by the *TurboTax* menus. For example, there are 13 choices on the Help menu and three ways to print your tax form (with separate options for printing supporting statements); you may find yourself using all three print choices before you see the type of return you're expecting.

Regular *TurboTax* for DOS users, who have become accustomed to the program's idiosyncrasies, will feel right at home and should be thrilled with the improvements made this year. The manual is vastly improved, more features are available, and ChipSoft has promised a significant expansion of telephone support. It's still the fastest tax program and will remain the favorite of many. ■

Laura Lou Meadows is a tax attorney who has reviewed tax software for PC Magazine every year since 1985. Lance N. Ulanoff is a staff editor at PC Magazine. Gus Venditto is a former executive editor at PC Magazine.



REPLACEMENT KEYBOARDS: The Write Stuff

Looking to replace your old alphanumeric input device? Any of these 16 keyboards could put the spring back into your typing. Not only that, but some of the better offerings are priced below \$50.

BY EDWARD MENDELSON You can shout at your PC as much as you like, but if you want it to pay attention, you better use the keyboard. With a mouse, you can select text that has already been entered into a menu or document, but when you want to enter words or numbers for the first time, only a keyboard can get them there.

A well-designed, well-constructed keyboard makes computing a pleasure. If you're dissatisfied with the feel of your current keyboard, or it has simply grown old and shopworn, it may be time to

think about getting a replacement. When buying a keyboard, the three major factors to consider are layout, touch, and compatibility.

The layouts of most of the products in this review conform—with more or less minor variations—to the IBM Enhanced standard. While some users prefer relatively nontactile, silent touch keys, others like a more positive, clickier feel. Compatibility is seldom an issue with today's keyboards. In informal testing, all of the keyboards we review that claimed compatibility with a standard IBM PC-XT worked perfectly with it. Additionally, none of the keyboards had any problems when attached to a Compaq Deskpro 25e, a Compaq Deskpro 386/25, a Dell System 310, an IBM PS/2 Model 70, or an IBM PC AT 286/12. In special cases, however, we did experience some problems and discuss those in the reviews.

Most keyboards are built on the same general ergonomic design, with a gently curved slope of the key tops from back to front. The degree of the slope and the curvature may vary slightly from keyboard to keyboard. If you end the day with

aching wrists and fingers, it's possible that the real culprit may not be the keyboard itself—though one with an awkward layout or keys that require heavy pressure may pose a health hazard—as much as the way you sit at it. A variety of ergonomic keyboard enhancements, ranging from wrist rests to specially designed arm rests, are available for users who are at risk for carpal tunnel syndrome (see the sidebar "Healthier Typing with Keyboard Enhancements").

REVIEW CRITERIA

In this review, *PC Magazine* looks at 16 replacement keyboards priced from \$31 to \$239. Informal discussions with keyboard manufacturers show that the 11 vendors we included constitute the bulk of the main players in today's market. These vendors include ALPS, Cherry, Chicony/Datajets, DataDesk, Honeywell, IBM/Lexmark, Key Tronic, Maxi Switch, NMB, Northgate, and Radio Shack/Tandy.

This sampling of the major vendors showed that variations in the quality of a

keyboard can lower the price of a desktop system by \$100 or more. The keyboard is one of the more obvious corners for cheap clone makers to cut. Even so, some of the better keyboards we reviewed came in under \$50.

SETTING THE STANDARD—AGAIN

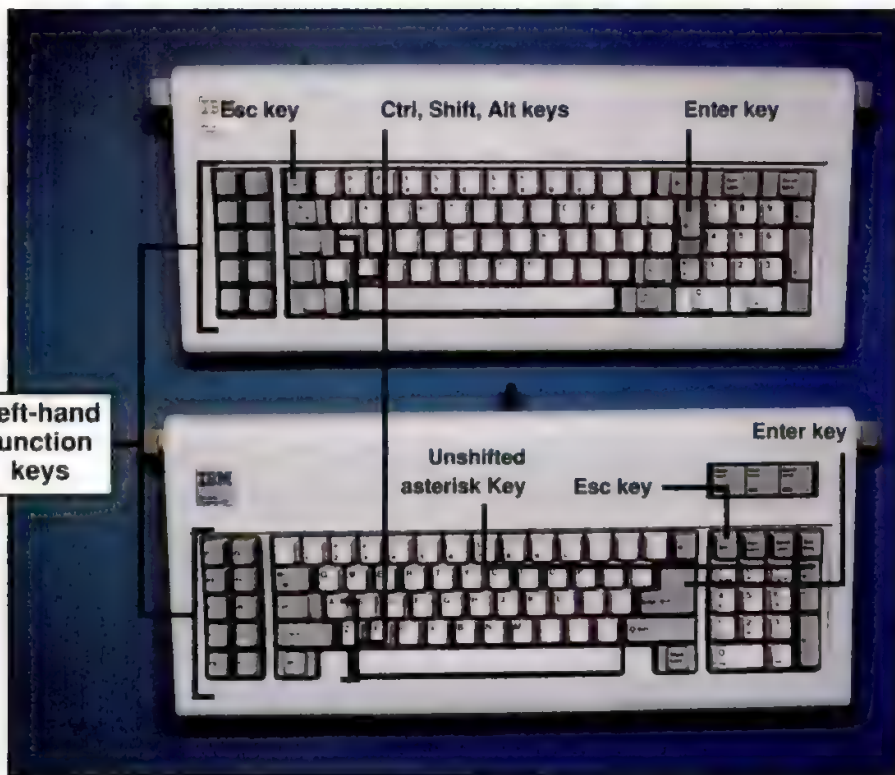
All of the keyboard vendors whose products are featured here offer layouts that exactly or almost exactly reproduce the layout of IBM's Enhanced 101 Key Keyboard, which IBM decreed as the standard for all of its computers in 1987.

In fact, the Enhanced design was IBM's third keyboard standard for PCs. The original IBM PC and XT keyboard had 83 keys, with ten function keys on the left and a combined number pad and cursor pad on the right. The Ctrl, Left Shift, and Alt keys were arranged in a line next to the function keys; Esc was to the left of the numbers in the top row.

To the right of the Right Shift key, an unshifted asterisk key let you type *.* without acrobatics. Between the tiny Left Shift and Z was a Backslash/Vertical key. The Enter key was narrow, vertically aligned, and easy to miss. The design was a mixture of sensible and absurd layout decisions combined with a splendidly positive touch that many users believe no other manufacturer has equaled.

IBM's next design was the original AT keyboard. This was incompatible with the PC-XT design, but could be programmed via the MODE command and other utilities to change both the rate at which a held-down key was repeated and the delay before the first repeat. The AT keyboard again had ten function keys on the left, but exiled Esc and the unshifted asterisk to the number pad. The Enter key was L-shaped, and the Backslash key occupied the spot that used to be the left half of the Backspace key, which was reduced to the width of a single alpha key.

When IBM upgraded the AT, it introduced the Enhanced model, which was compatible with the original AT model, but had a drastically different layout. The Esc key and 12 function keys were now along the top, the number pad moved to the right, and a new cursor pad was placed between the alpha keys and number pad. The cursor pad consisted of an inverted T at the bottom, with a separate bank of six keys at the top—Ins and Del on the left column, then Home, End, PgUp, and PgDn. Computer users started pressing Del when they meant End, with some-



The original, 83-key IBM-XT keyboard was the progenitor of a design still favored by many users: function keys on the left, with Ctrl, Left Shift, and Alt keys arranged in a line next to them. The original IBM AT keyboard also sported function keys on the left but introduced the L-shaped Enter key. On the original AT model, the Esc and unshifted asterisk keys were exiled to the number pad.

times disastrous results (for example, when a large block of text happened to be defined on-screen at the time). The Backspace returned to its original double width. The Backslash replaced the upper part of the two-row AT Enter key, and the Enter key now occupied a single row. CapsLock migrated to the old site of the Ctrl key (to the despair of *WordStar* users), and twin Ctrl and Alt keys flanked the Spacebar.

VARIATIONS ON THE STANDARD

Like it or not, the Enhanced layout has become the unshakable corporate standard, although many replacement keyboards alter this standard slightly by restoring the original AT's two-row L-shaped Enter key, single-width Backspace, and top-row Backslash key. The alternative you prefer depends on whether you more often press the wrong key when aiming for a single-width Backspace or when aiming for a single-row Enter key. Some keyboards also let you reverse Ctrl and CapsLock, and some let you remove an IBM-standard annoyance by locking the period and comma keys so that their shifted states generate a period and comma instead of angle brackets.

Some users still prefer function keys on the left and the vertical alignment of Ctrl, Left Shift, and Alt as in the PC and original AT. Northgate has models that allow this arrangement and also place a star near the period for easy typing of DOS pathnames. Other vendors offer other subsets of the XT and AT layouts. All these keyboards are electrically equivalent to Enhanced keyboards despite differences in layout.

IBM pioneered the ergonomic curved profile found on most desktop keyboards. Seen from the side, the five rows of keys describe an arc. Many keyboards (including IBM's) use a curved base below the keys to make this profile possible; the reviews refer to this as a *fully curved profile*. Others employ a flat base and use key tops of different heights in each row to create a curved profile. The key travel in each row is the same, and the only reason to prefer the fully curved profile is aesthetic.

All the keyboards in this story use the standard 0.75-inch key spacing. One or two laptop keyboards (like the one included with the Dell System 320N) squeeze the keys slightly closer. Some users may never notice the difference; others find the squeezed keyboards uncomfortably cramped.

One design difference among the keyboards reviewed here is their pencil-tray depth. Typically, pencil trays on these models are anywhere from 1 to 2 inches deep, although on some units they are practically nonexistent. If space is a concern, you may want to opt for a more compact model with little space devoted to pencil-tray service.

TOUCH AND TECHNOLOGY

The touch of a keyboard can be divided into two basic categories: those with a positive (or tactile), hard clicky touch versus keyboards with a relatively non-tactile, silent (or soft clicky) touch. Mail-order dealers report that user preferences divide more or less evenly between the two categories.

IBM's keyboards are the leading examples of a clicky, tactile response. When you press an IBM key top, pressure builds until the contact is complete—or, as keyboard engineers say, the key is "made." At that point, the user receives aural feedback via a loud mechanical click and positive tactile feedback via an abrupt drop in pressure. An audible click is far less important than precise tactile feedback, and you should probably avoid third-party keyboards that generate an annoying electronic click or add mechanisms solely to produce noise beyond that caused by the switch itself. Fortunately, such keyboards are out.

Compaq's desktop keyboards, with some recent exceptions, offer the most famous examples of silent, soft, and imprecise tactile feedback. Keyboards of this kind give less positive feedback and often have a soft, pliable feeling at the

bottom. It tells you when you've made the key, but it doesn't tell you very exactly. Some users find these keyboards more restful, because there is none of the sharp, exact response you get from an IBM-style design. Others find the imprecise feedback distracting and tiring. (We did not review any of Compaq's keyboards here. Although they have a list price of \$249, you can typically find them for around \$180 at most Compaq dealers. Some dealers even discount a new keyboard if you return the old model.)

Although you might expect a keyboard's touch to be directly related to its switch technology, this is not always the case. Keyboards with mechanical switches tend to have the positive clicky touch you would expect, but keyboards that use capacitive, conductive rubber-dome, or membrane technology aren't always mushy (see the sidebar "Behind the Key Caps" for a complete description of these technologies). IBM's Enhanced 101 Key Keyboard uses membrane technology, but the keys are actuated by a mechanical spring that gives an exceptionally positive touch. Most rubber-dome keyboards have a rubbery feel, but IBM/Lexmark's Quiet Touch Keyboard (not reviewed here), which is based on the keyboard of IBM's PS/2 L40 SX, has as snappy a touch as you could wish for.

When *PC Magazine* last reviewed keyboards in 1989, no major third-party vendor used membrane technology; now, it's highly popular. While membranes used to be the least reliable keyboard technology, today some membrane keyboards are rated at 50 million key presses or more. This means you should choose a keyboard based on its touch and the general quality of its circuitry and construc-



Most IBM AT-bus computers use a 5-pin DIN connector for the keyboard cable. IBM PS/2s and many other recent models use 6-pin mini-DIN connectors. Most keyboard manufacturers offer a 5-pin-to-6-pin adapter as an option.



BEHIND THE KEY CAPS

Though mechanical and membrane key-switch technologies are by far the most popular methods, there is more than one way to press a key.

Keyboard-switch technologies have not changed much in the past few years, but the technologies favored by manufacturers have. For instance, when we last reviewed keyboards, no major keyboard vendor used membrane technology. Now it is employed by well-known manufacturers such as Honeywell and IBM, among others.

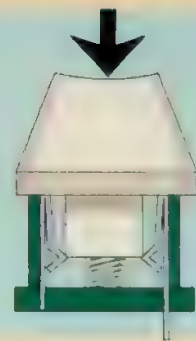
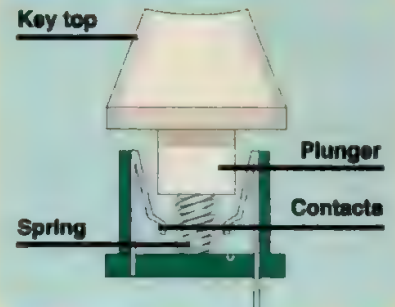
While mechanical switches still retain their popularity and conductive rubber-dome switches still maintain a presence in the market, none of the products we saw use *capacitive-switch technology*—once IBM's choice for its Enhanced-style keyboards. A variation on this theme is *capacitive-membrane technology*, in which capacitive plates are part of the membrane itself. None of the products we looked at use capacitive-membrane technology, but a few keyboard manufacturers do employ it.

Mechanical switches are one of the most popular technologies. Keyboards that use mechanical key switches tend to have a positive, tactile touch and generate audible clicks when keys are depressed. The feel and sound result from the contact that occurs between conductive materials on the plunger; the conductors are often made of gold, gold alloy, or mylar with silver-carbon overlay.

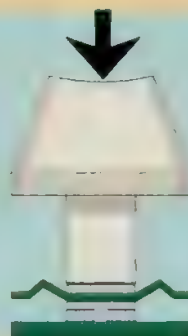
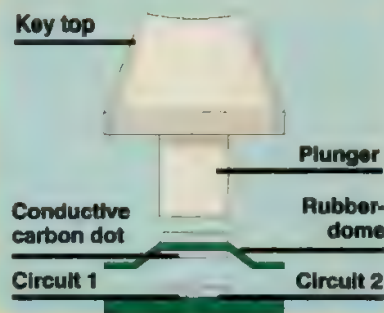
Some membrane keyboards (notably from Lexmark and Tandy) use mechanical spring actuators as the mechanism in the keys but a different technology to close the electrical connection. This allows them to retain the solid feel of mechanical switches without compromise; you won't confuse these with keyboards that try to imitate mechanical switches by adding electronic clicks.

One problem with mechanical switches is the number of parts required. A mechanical-switch keyboard may use as many as three times the parts of a membrane-switch model. Cherry, Chicony, DataDesk, NMB, and Northgate supplied mechanical switch models.

MECHANICAL SWITCHES



CONDUCTIVE RUBBER-DOME SWITCHES

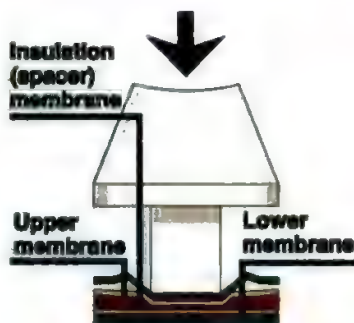
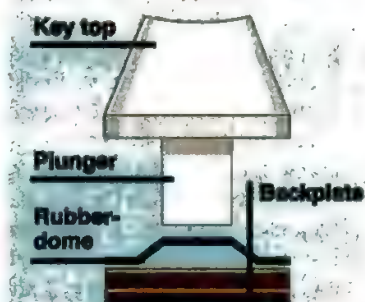


The Asian branches of ALPS are well known for the mechanical switches they provide to a number of other keyboard manufacturers, but ALPS America uses **conductive rubber-dome technology** in the keyboard it supplied. The ALPS MDS101 was one of only three products that use this method (along with the Maxi Switch MaxiPRO and Tucson-101).

This technology is based on a carbon dot that lies under the center of a raised rubber dome on each switch. The rubber domes are usually part of a single thin sheet of rubber, but they can also be individual pads under separate keys. (The former method offers a way to remove dust easily and clean up liquid spills, but if a part goes bad, you'll need to replace the entire mechanism.) Press the key and the dome collapses, pushing down the carbon dot to complete the circuit between two electrical contacts.

Not surprisingly, conductive rubber-dome keyboards typically have a rubbery feel, although the Lexmark Quiet Touch Keyboard (not reviewed here) is as snappy and exact as any mechanical-switch model.

MEMBRANE SWITCHES



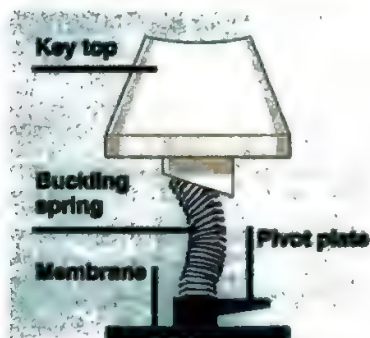
Membrane switches are now among the most popular technologies. Once the least reliable keyboard technology, with the shortest life expectancy, current versions of membrane-switch keyboards are among the most reliable of all. Membrane switches use a very small number of parts, and current materials are long-lasting and resistant to environmental changes. Five of the companies reviewed—Honeywell, Key Tronic, NMB, Tandy, and even IBM—now employ this technology in their keyboards.

Membrane switches still consist of two layers of polyester film, each with a silk-screened pattern of conductive silver carbon ink. A layer of insulation between the two membranes has tiny holes in strategic locations. When you push down on a key, a cushion—sometimes an inverted rubber dome—squeezes the conductive membranes, causing them to make contact and close the circuit.

There are other implementations. IBM uses a buckling spring and a pivot plate. When pushed, the spring causes the plate to rotate, which closes the circuit. The spring can then be used to return the key to its “up” position, similar to conductive rubber-dome technology.

Another point in favor of membrane switches is that they need not have a mechanical touch. While some of the membrane entrants offer little better than slightly muted mechanical clicks, the current IBM and Tandy models provide the full clickiness of their capacitive-based predecessors. Like the IBM, the Tandy keyboard maintains its particular feel by the use of the same kind of spring actuators used in its older models to trigger the membrane switches. IBM's keyboard technology is patented, so the Tandy can't exactly match its feel, but it comes close.

IBM'S IMPLEMENTATION OF MEMBRANE SWITCHES



Membrane technology
is now reliable, with
some keyboards rated
at 50 million key
presses or more.

tion, not by the reputation of its switch technology.

OPERATING CONCERNS

The keyboards that are reviewed in this story require between 1.9 and 2.5 ounces of force to make the key. Most laptop keyboards require 2 ounces or less. The jury is still out on the question of whether a lighter force makes for more accurate typing.

All the keyboards in this story also have a key travel between 3.5 and 4.5 millimeters. Many laptops and notebooks have a key travel of only 2.5 to 3.8 mm. You might expect shorter travel to reduce fatigue, but again, no studies have confirmed this.

Keyboard vendors differ in their handling of multiple alpha keys held down at the same time. Some vendors of no-name keyboards block out a second or third alpha key pressed while another alpha key is held down. (All keyboards support combinations like Ctrl-Shift-Alt-alpha.) Name-brand keyboards generally have a feature called “*n*-key rollover,” which lets all keystrokes pass through, sometimes with a slightly different number of keys passed for keys pressed with the index fingers as compared with other keys. *N*-key rollover is crucial for fast typists.

IS YOUR KEYBOARD COMPATIBLE?

Most AT-bus computers use a 5-pin DIN connector for the keyboard cable, and almost all replacement keyboards have the 5-pin connector attached. IBM PS/2s and many other recent models use 6-pin mini-DIN connectors, and 5-pin to 6-pin adapters are readily available; 6-pin to 5-pin adapters are harder to find. IBM uses a detachable cable, and you can order a cable with either a 6-pin or 5-pin connector on the end.

Beyond this obvious issue, compatibility generally is not a problem unless

you're choosing a keyboard to use with an older Novell network or you're replacing the keyboard on an XT-class machine or not-quite-IBM-compatible machines such as the Tandy 1000 or AT&T 6300.

Many third-party keyboards seem to slow down when using some versions of *NetWare* in nondedicated mode. You could type as quickly as ever, but the workstation accepted keystrokes with painful slowness. Many vendors now claim their keyboards are fully compatible with *NetWare*. If you use an older version of *NetWare*, it might be a good idea to ask the keyboard manufacturer about compatibility with it.

If you're upgrading the keyboard on an

old XT, make sure the replacement is electrically compatible with the XT as well as later models. Most third-party models have a switch that lets you select XT or AT operation. Some use circuitry that automatically senses the type of computer. This auto-sensing feature sometimes fails, and if you can't override it with a switch, you may not be able to use your keyboard at all until you plug it into another computer.

Northgate is one company that specifically allows you to use its keyboards with otherwise incompatible Tandy 1000 and AT&T 6300 models. Check carefully with

the keyboard vendor before buying any other third-party keyboards for these machines.

Some laptops have connectors that let you plug in desktop keyboards when you're not on the road. Laptops that do not have keyboard connectors will soon be able to use an external keyboard attached via the laptop's parallel port. *PC Magazine* found no parallel-port keyboard currently on the market, but you can expect them early in 1992.

Meanwhile, one of the keyboards reviewed here will probably make the ideal companion to your desktop computer. You owe it to your fingers and wrists to use the best and most comfortable keyboard you can find.

ALPS AMERICA ALPS MDS101

All reviews by Edward Mendelson

ALPS America's \$85 MDS101 keyboard has a layout identical to that of an IBM Enhanced keyboard but in a smaller (18.9 inches wide) and lighter (3 pounds 5 ounces) case. The plastic molding around the keyboard area has curves at the corners that are so precisely detailed that ALPS's exterior design can challenge the best for overall elegance.

Although the Japanese and Asian branches of ALPS are famous for the mechanical switches used in Chicony, DataDesk, Northgate, and other keyboards, ALPS America uses conductive rubber-dome technology for its American-made MDS101. This keyboard—the first ALPS is selling directly to end users—has a light touch (2 ounces) and a slightly rubbery, imprecise feel as you reach the base of the keystroke. You'll

PC EDITORS' CHOICE

- IBM Enhanced 101 Key Keyboard
- Northgate OmniKey/101
- Northgate OmniKey/Ultra-T

Perhaps more than in any other part of the industry, buying decisions in the keyboard market are made on the basis of highly subjective criteria. Click versus silent, positive response versus relatively nontactile, function keys on the left (XT style), versus function keys along the top. . . . The list goes on, as it really should. After all, the keyboard is the part of the computer with which you have the most direct contact.

No matter what your personal preferences are, you can't argue with the quality, solidity, and overall reliability of the original classic heavyweight. The IBM Enhanced 101 Key Keyboard has a slightly heavy touch, but its spring-actuated keys have the most positive tactile feedback of any keyboard on the market. It's built to last forever, and no hardware manufacturer will ever dare to build equipment that is incompatible with it. At \$217, it is the second-most-expensive keyboard reviewed, but if you are looking for the kind of response it offers, it's worth the money. (If you insist on a quieter keyboard, IBM's upcoming 101 Key Quiet Touch promises to give you just what its name suggests while still maintaining a snappy

touch—if not quite the Enhanced-quality positive feel.)

OTHER WINNERS

If you want more options and more control over your keyboard than IBM is willing to give you, the best choice by far is the \$129 Northgate OmniKey/Ultra-T. The Ultra-T has two sets of function keys and additional keys that make typing DOS pathnames easier. An optional utility disk lets you customize virtually every detail of its operation. If you want the old Ctrl-Shift-Alt sequence on the left, only Northgate makes it possible. The Northgate OmniKey/101, with its standard Enhanced layout, is customizable in the same way; mechanical switches give it the same positive, clicky touch as the Ultra-T. At \$89, it's a winning, moderately priced alternative to IBM's Enhanced 101 Key Keyboard.

Finally, if you're looking for an inexpensive keyboard that imitates the soft, quiet touch of the Compaq without making you pay Compaq's price, the NMB RT-101+ Membrane comes close. It is not without flaws, but at \$31, it's an extraordinary bargain that deserves an honorable mention.



FACT FILE

ALPS MDS101

ALPS America, 3553 N. First St., San Jose, CA 95134; 408-432-6000.

List Price: \$85; mini-DIN adapter, \$7.95.

Dimensions (HWD): 1.5 x 18.9 x 7.5 inches.

Weight: 3 lbs. 5 oz.

In Short: The ALPS MDS101 conforms exactly to IBM's Enhanced keyboard layout but in a more compact case. The keys have a light, slightly rubbery touch. Elegantly designed and solidly made, the keyboard should work well with most computers.

CIRCLE 456 ON READER SERVICE CARD

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Get incredible value on the Tandy 1800 HD with a 286 microprocessor and 20MB hard drive—all for only \$1299. MS-DOS® 5.0 and the DeskMate® Graphical User Interface are installed on the hard drive and ready to use. A 3.5" 1.44MB floppy drive and DeskMate software (with nine easy-to-use productivity applications—including a word processor and spreadsheet) are also built in. The easy-to-read VGA display produces graphics in 32 shades of gray. The rechargeable battery delivers 2.5 hours of power. At under six pounds, it's the perfect tool for anyone on the move!

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HARDWARE KEYBOARDS

also hear a mechanical click as the key completes the upstroke after making the connection.

The keyboard's curved profile is achieved by using shallow key tops in the home row and deeper key tops in the other rows. The 72-inch cable ends in an AT connector; a mini-DIN adapter costs \$7.95. A channel in the keyboard base lets the cable emerge from the center or either end of the keyboard. The keyboard is supposed to sense automatically whether it is attached to an IBM PC-XT or AT computer. This auto-sensing feature failed on our machine—an 80386 with an AMI motherboard and customized with a keyboard handler that accepts both XT and AT keyboards. Because this keyboard doesn't let you override auto-sensing with switches, it was unusable until we moved it to another computer.

The ALPS MDS101 comes standard with a three-year warranty on parts and labor. It is a solidly made, elegant choice that, with all but a very few computers, should work reliably and smoothly.

CHERRY CORP.

Cherry G80-1000

Cherry G80-3000

Cherry's German-made keyboards come in virtually any touch you want. The \$104.50 G80-3000, which has the standard IBM Enhanced keyboard layout in a slightly smaller case (18.5 inches wide), is sold in versions with click-tactile and

silent-tactile feel. They are also sold in linear-feel versions without tactile feedback (this means that the key descends straight to the bottom of its travel, but you can't feel exactly when the connection is completed). You can buy the \$109.97 G80-1000, a full-size Enhanced keyboard, with the same tactile options. Whichever touch you choose, Cherry gives you mechanical switches whose touch is rated at a relatively light 2.1 ounces.

Cherry delivered a G80-3000 with a silent-tactile feel and a G80-1000 with a click-tactile feel. Both are solidly built units weighing 4 pounds 5 ounces, with a 72-inch cable ending in an AT connector. A mini-DIN adapter is a rather costly \$20.60. The G80-1000 lets you position the cable at the center or either end of the keyboard; the G80-3000 has the cable attached at the right. A switch adapts both keyboards for use with IBM PC-XTs or ATs, and both are fully compatible with Novell networks.

The so-called silent-tactile touch of the tested G80-3000 has in fact a mechanical click when you hit the key and a second, quieter click when the key returns to the normal position. The click-tactile feel of the tested G80-1000 is noisier and higher pitched, with a complex sound and less positive feedback than the silent version.

SOME NOTABLE DIFFERENCES

Both of these keyboards have a stepped CapsLock key with a substantial gap on the right-hand side to avoid accidentally hitting it when you mean to hit the A key. Both keyboards have a curved profile achieved by using shallow key tops for the home row and deeper key tops elsewhere.

Key-top lettering on both units differs noticeably from the IBM standard. The caret over the top-row 6, for example, is gigantic, and the cursor-key arrows are large and off-center in a way that may distract expert users. The bases of the key tops have squared-off corners unlike the curved corners found in most designs.

Cherry keyboards come standard with a one-year warranty on parts and labor. Among Cherry's line of products not reviewed here are its \$95 G81-3000 and \$99 G81-1000 membrane-switch keyboards and its \$360 G80-3500 keyboard with, in place of the cursor pad, a touch plate that doubles as cursor keys or mouse. Cherry also makes keyboards that read bar codes and magnetic cards.

There are few differences between the Cherry G80-1000 and the G80-3000. If, however, you are inclined to a solid, positive touch, opt for whichever model you prefer in the silent-touch, mechanical-switch version.

CHICONY AMERICA INC./

DATAJETS INT'L INC.

Chicony KB-5181

Datajets Int'l, a subsidiary of Chicony America, is the place to turn to for the \$49.99 Chicony KB-5181. The keyboard combines low cost, high quality, and a layout that, except for an L-shaped Enter key and single-width Backspace, conforms to the IBM Enhanced standard.

The 4.4-pound Chicony keyboard uses Japanese ALPS mechanical switches; it offers a positive feel, a light and responsive touch, and a mechanical click. The keyboard has a curved profile, achieved by using shallow keys in the home row, slightly less shallow ones in the next rows, and full-depth keys in the most distant rows.

Attached to the keyboard is a 72-inch cable with an AT connector; a mini-DIN adapter costs \$9.99. A channel on the base lets the cable emerge from the center or either side of the keyboard. A switch lets you adjust the keyboard for IBM PC-XT or AT machines.

ISING TO NEW HEIGHTS

Unlike most other replacement keyboards, the Chicony has two sets of rubber feet that let you raise it to two different angles above the desktop. A molded plastic dust cover fits over the keys. The product includes a three-year warranty on parts and labor, a consideration not usually offered



FACT FILE

Cherry Corp., 3600 Sunset Ave., Waukegan, IL 60087; 708-662-9200.

Cherry G80-1000

List Price: \$109.97; mini-DIN adapter, \$20.60.

Dimensions (HWD): 1.4 x 19.1 x 8.2 inches.

Weight: 4.3 lbs.

Cherry G80-3000

List Price: \$104.50; mini-DIN adapter, \$20.60.

Dimensions (HWD): 1.5 x 18.5 x 7.7 inches.

Weight: 4.5 lbs.

In Short: Cherry Corp.'s solid German-made keyboards reviewed here use mechanical switches that you can order in three different touches. The layout matches IBM's Enhanced design. Be mindful, however, that the key top lettering differs significantly from the IBM standard; cursor-key arrows, for example, are large and off-center and may prove distracting.

CIRCLE 457 ON READER SERVICE CARD



FACT FILE

Chicony KB-5181

Chicony America Inc./Datajets Int'l Inc., 3111 Miraloma Ave., Anaheim, CA 92806; 714-630-6662.

List Price: \$49.99; mini-DIN adapter, \$9.99.

Dimensions (HWD): 1.3 x 19.1 x 8 inches.

Weight: 4.4 lbs.

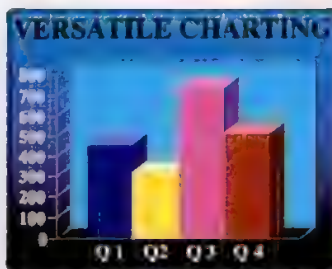
In Short: The Chicony KB-5181 is a well-made keyboard at a remarkably low price. The L-shaped Enter key and single-width Backspace differ from the IBM Enhanced layout, but the touch is light and responsive. The product's three-year warranty is unusual for this price class.

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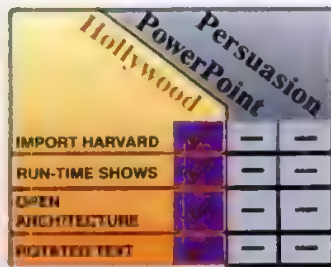
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with lower-priced keyboards.

PC Magazine Labs did not test the \$79.95 Chicony KB-5581 trackball model, which uses the same high-quality switches as the KB-5181. Its layout is a bit strange: The trackball is at the far right, the number pad is between the alpha keys and the trackball, and the two parts of the normal cursor pad are at the top of the keyboard

to the right of the function keys. The function keys are arranged in two banks of six keys. You can find better layouts than the 5581 trackball keyboard, but you can't find many better-quality keyboards at a lower price than Chicony's standard KB-5181.

DATADESK INTERNATIONAL DataDesk Switchboard DataDesk Turbo-101

If you've ever felt so frustrated with your keyboard's layout that you wanted to take it apart, consider DataDesk International's \$239 Switchboard. You can split it into

HEALTHIER TYPING WITH KEYBOARD ENHANCEMENTS

by Angela Gunn

You can replace your keyboard, but not the hands you use for typing at it. It's important to take care of them. A growing number of office workers are being diagnosed with ailments that stem from long hours at the computer. Primary among these is carpal tunnel syndrome (CTS)—a nerve disorder resulting from prolonged compression of the nerves, cartilage, and tendons in the wrist. Caused primarily by bad keying habits, it progresses from an irritating condition (numbness and shooting pains in the arms) to a debilitating condition (permanent inability to use the hand). Wrist surgery to repair the damage caused by CTS is the second most frequently performed sur-

gical procedure in the U.S. (For more information on CTS, see "Does Your PC—Or How You Use It—Cause Health Problems?", *PC Magazine*, November 26, 1991, page 491.)

Products claiming to increase keyboarding comfort and decrease the risk of CTS have proliferated, but like the words *diet* and *lite*, "ergonomic" is often in the eye of the advertiser. Most experts agree that if a product aims to promote the ideal keyboard posture, it's going to be the posture that takes the least effort to hold.

HAVE YOU HURT YOURSELF?

Your typing habits may be dangerous. Do you pound the board? The shock of impact will tire your fingers and arms

and cause strain on your bones and connective tissues. Do you do marathon work sessions? It's better to stop every hour and do something else, whether it's simple stretching exercises or a quick mail run. Do you cradle the phone between your ear and shoulder when you type? Buy a headset.

Time spent away from your keyboard may help you to cope more effectively with time spent at it. Brief periods of isometric exercise may help you stay healthy. Books such as Julia Lacey's *How to Survive Your Computer Workstation* offer quick, useful exercises to do at your desk as well as longer-term actions you can take to protect yourself from your computer and its side effects. Meanwhile, there are vendors out there making products that will keep your computing comfortable as well as healthy.

For typing at your workstation, your wrists should be naturally in line with your arms; flexing them forward or extending them backward for long periods of time will hurt them. Forearms ought not to be half-raised, as they are at most desks (which are generally 3 inches too high, at 29 inches), but should be at least parallel to the floor. And neither wrists nor forearms are built to support body weight, as they do when you rest them on your desk.

The simplest keyboard enhancements are wrist rests, padded bars the same height as the keyboard on which the wrists can rest flat, neither flexing nor extending. Most computer-supply sources offer wrist rests for desktop use or PC "pillows" for those who plop the keyboard in their laps. Additionally, many keyboard drawers, such as Wholesale Ergonomic Products' \$169.95 Keyboard and Mouse Support, have a built-in rest.



Shown are products designed to help users avoid the potentially debilitating effects of CTS. They include, from left to right, Wrist Trolley and Keyboard Platform, Wrist Pro, and PCD Maltron Ergonomic Keyboard.

three pieces, put the pieces back together in a different arrangement, and get back to work in minutes. If, on the other hand, you like the standard Enhanced layout, consider DataDesk's \$99.95 Turbo-101: It exactly matches IBM's layout except for an L-shaped Enter key and single-width Backspace.

At the top of the Switchboard is a row

of IBM-style function keys. Below are three modules: an alpha keyboard, an inverted-T cursor keypad, and a number pad with an extra equals-sign key. You can snap out the modules and rearrange them any way you like. A 96-inch cable means you can put the keyboard anywhere.

DataDesk also offers an optional \$149 trackball module that requires a free serial port on the computer and a vertically arranged \$49 15-key function key module. Each can replace the inverted-T cursor module or fit on an optional base that attaches to either side of the keyboard. The additional electronics and connectors needed for the removable modules give

Since the wrists should be kept straight, the angled keyboard supports offered by many vendors might not be useful for you; some authorities even recommend that the keyboard lie flat on the typing surface. The \$49.95 Wrist Pro is a wrist support system with an adjustable stairstep design. It supplies "neutral" wrist support (neither extended nor flexed) and lets you position the board comfortably beneath your fingers. MicroComputer Accessories' \$49.95 Keyboard Platform is another combination keyboard platform and wrist support.

One product designed to promote healthier typing is not a keyboard enhancement, but a keyboard itself. The two-handed \$637 PCD Maltron Ergonomic Keyboard, distributed by Applied Learning Corp., was designed as an evolution in ergonomics. It divides the alphabet keys into two groups and places them in hemispherical indentations on either side of the case. The functions keys line the top while the numerics are arranged in typical fashion in the center of the keyboard. Shift, Enter, Ctrl, Alt, End, Home, and cursor keys are placed in mini-indentations near the lower corners of the alphabet keys—about where your thumbs would be as you were typing.

If you've already done yourself serious damage from keyboarding, you may need the full-body approach of the Compu-Rest Arm Support from Wholesale Ergonomic Products. This is an arm rest (costing \$269.95 per arm) attached to the desktop on either side of the computer; it allows users to move their hands across the keyboard without moving their wrists or putting excessive strain on the arms and shoulders. It is designed for people with advanced CTS; it's medical equipment,

and the steep price is somewhat softened by billing it to your insurance company or writing it off as a medical expense. MicroComputer Accessories' \$99.95 Wrist Trolley (two padded platforms on a rolling track attached to the edge of the desk) also allows hand movement without wrist action. And Fox Bay Industries makes the \$59 CarpalRest, which supports the wrists, hands, and upper body on a padded, contoured surface.

ATTRACTING ATTENTION

Wrist Pro offers a booklet describing ergonomics issues and detailing how to adapt the office you're in for your safety. Some states have already taken legal measures to ensure that offices are modified for worker comfort.

Last year, San Francisco passed the VDT Worker Safety Ordinance covering computer operators in offices of 15 or more. The law requires detachable keyboards, adjustable chairs, and arm and wrist rests for any employee who asks, as well as regular work breaks. The Occupational Safety and Health Administration (OSHA) is now planning national regulations, which may be even tougher than the California laws. However, research in the field is still young, and some businesses believe that these laws are based more on conjecture than scientific proof.

The bottom line is that if you're in pain and you suspect your keyboard habits are responsible, you may want to invest in one of these products before the situation gets any worse. ■

PCD Maltron Ergonomic Keyboard
Applied Learning Corp., 1376 Glen Hardie Rd., Wayne, PA 19087;
215-688-6866.

List Price: \$637.

CIRCLE 474 ON READER SERVICE CARD

How to Survive Your Computer Workstation

CRT Services Inc., P.O. Box 420127, Laredo, TX 78042; 800-256-4379, 512-722-4408.

List Price: \$14.95 plus \$2 for shipping and handling.

CIRCLE 475 ON READER SERVICE CARD

CarpalRest

Fox Bay Industries Inc., P.O. Box 4409, Kent, WA 98032; 800-874-8527, 206-941-9155.

List Price: \$59; CarpalRest Mouse Pad, \$49.95; CarpalRest Block (small wrist pad without baseplate), \$29.

CIRCLE 476 ON READER SERVICE CARD

Keyboard Platform Wrist Trolley

MicroComputer Accessories, 5405 Jandy Pl., P.O. Box 66911, Los Angeles, CA 90066-0911; 800-521-8270, 310-301-9400.

List Price: Keyboard Platform, \$49.95; Wrist Trolley, \$99.95.

CIRCLE 477 ON READER SERVICE CARD

Compu-Rest Arm Support Keyboard and Mouse Support

Wholesale Ergonomic Products, 2635 Cleveland Ave., #5, Santa Rosa, CA 95403; 707-544-3020.

List Price: Compu-Rest Arm Support, \$269.95 per arm; Keyboard and Mouse Support, \$169.95; Keyboard Support only, \$159.95.

CIRCLE 478 ON READER SERVICE CARD

Wrist Pro

Ergonomic Solutions to Keyboard Comfort, Productivity and Safety Wrist Pro, 16100 N. Outer Forty, #250, St. Louis, MO 63017; 800-348-8633, 314-532-2827.

List Price: WristPro, \$42.95; with pad, \$49.95; pads, \$11.99. Call to request booklet information.

CIRCLE 479 ON READER SERVICE CARD

HARDWARE

KEYBOARDS

the Switchboard its heavy weight (5 pounds) and stable feel. The Switchboard uses Japanese ALPS mechanical switches with a positive-tactile feedback, standard 2.5-ounce operating force, and a mechanical click when contact is complete.

DIP switches let you reverse Ctrl and CapsLock (spare key caps come in the box) and make the shifted period and comma keys enter, respectively, a period and a comma; you can't get back the angle brackets without changing the switches. DIP switches also let you use the keyboard with IBM PC-XT-type machines. Tiny indicator lights are on a separate panel at the top right of the unit.

Even if you don't rearrange its modules, the Switchboard's layout differs from the Enhanced standard in small but significant ways. Because the unit is designed for both the Macintosh and the PC, you'll find two Mac-compatible Option keys between the Ctrl and Alt keys in the bottom row; on the PC these keys mimic Alt-F9 and Alt-F10 and can't be changed. A key at the top right combines the functions of Ctrl and Alt.

A MORE STANDARD DESIGN

The Turbo-101, which closely follows the IBM Enhanced layout, has the same feel as the Switchboard but weighs 3.6 pounds. Like all of DataDesk's keyboards, including the Switchboard, the Turbo-101 uses Japanese ALPS mechanical switches. The keyboard offers a 2.5-ounce operating force and, like the Switchboard, a mechanical click when contact is complete.

At 18.9 inches wide, it's slightly smaller than the IBM design. The same generous 96-inch cord that comes with the Switchboard is also featured on the Turbo-101.

The keyboard is compatible with both XT and AT machines as well as PS/2s. DataDesk, however, does not sell mini-DIN connectors for PS/2 connections for either the Turbo-101 or the Switchboard. While the Switchboard comes standard with a three-year warranty on parts and labor, the Turbo-101 standard warranty extends only to two years.

DataDesk makes two other models not reviewed here. One is the \$195 PC-105, which resembles a Switchboard without separable modules, and with two Option keys that emulate Alt-F4 and Ctrl-Esc, both commonly used in Windows. The other is the \$129.95 Turbo-119, with sets of function keys along the side and top. In the place of an inverted T, the Turbo-119 has a nine-key cursor pad consisting of four standard arrow keys plus four diagonal keys that, for example, move one row left and one row up simultaneously. The middle key in the pad controls repeat rate. The keyboard has an L-shaped Enter key and double-width Backspace.

Except for the Turbo-101, which is a well-made standard replacement, DataDesk's keyboards are for users who want something different. They are well made and well supported, but if you buy any but the Turbo-101, you have to be prepared for their peculiar layouts.

HONEYWELL KEYBOARD DIVISION Honeywell 101 WN

The \$69 Honeywell 101 WN is a fairly lightweight keyboard (4 pounds) with a distinctive touch and a layout whose L-shaped Enter key and single-width Backspace are the only variations on IBM's Enhanced standard. This is a compact unit—slightly more than 18 inches wide—with a fully curved profile and an 84-inch cable ending in an AT-style connector. A mini-DIN adapter comes in the box. A DIP switch lets you adapt the keyboard for IBM PC-XT-style machines.

The keyboard uses membrane-switch technology, but an inverted rubber dome under each key top acts as a cushion to squeeze the membrane and close the switch. Don't confuse this with conduc-



FACT FILE

Honeywell 101 WN

Honeywell Keyboard Division, 4171 N. Mesa, El Paso, TX 79902; 800-445-6939, 915-544-5511.

List Price: \$69.

Dimensions (HWD): 1.7 x 18.5 x 7.3 inches. Weight: 4 lbs.

In Short: The Honeywell 101 WN is an economical keyboard using membrane switches with a responsive, slightly rubbery touch. The layout matches IBM's Enhanced except for a single-width Backspace and an L-shaped Enter key.

CIRCLE 480 ON READER SERVICE CARD

tive rubber-dome technology (see the sidebar "Behind the Key Caps"). The resulting touch is rated at 1.9 ounces—among the lightest on the market. A slightly muted mechanical click tells you when you have completed contact, and you hear another sound as the rubber dome bounces back to its original shape. Unless you lift your finger immediately after making contact, you can feel the rubber dome bouncing back sharply. The overall feel is responsive and slightly rubbery, without the excessive softness of many third-party keyboards.

The Honeywell 101 WN is well finished, but some of the key labels were slightly off-center in the samples sent to PC Magazine Labs. If you like its touch, the Honeywell keyboard offers a moderately priced alternative to no-name keyboards, and its three-year warranty on parts, labor, and replacement is three times as long as you get with many inexpensive models.

IBM/LEXMARK INTERNATIONAL INC. IBM Enhanced 101 Key Keyboard

Lexmark is the most famous keyboard manufacturer in the world and you've probably never heard its name. This paradox is more apparent than real: Lexmark is the name IBM's keyboard and printer unit adopted in 1991 when IBM spun it off as a separate company. Lexmark still makes virtually all of IBM's keyboards, including the \$217 Enhanced 101 Key Keyboard reviewed here, as well as some innovative smaller models.

The Enhanced 101 Key Keyboard is a hefty 5-pounder, at 19.4 inches wide, with



FACT FILE

DataDesk International, 9330 Eton Ave., Chatsworth, CA 91311; 800-328-2337, 818-998-4200.

DataDesk Switchboard

List Price: \$239.

Dimensions (HWD): 1.6 x 18.8 x 7.8 inches. Weight: 5 lbs.

DataDesk Turbo-101

List Price: \$99.95.

Dimensions (HWD): 1.5 x 18.9 x 6.6 inches. Weight: 3.6 lbs.

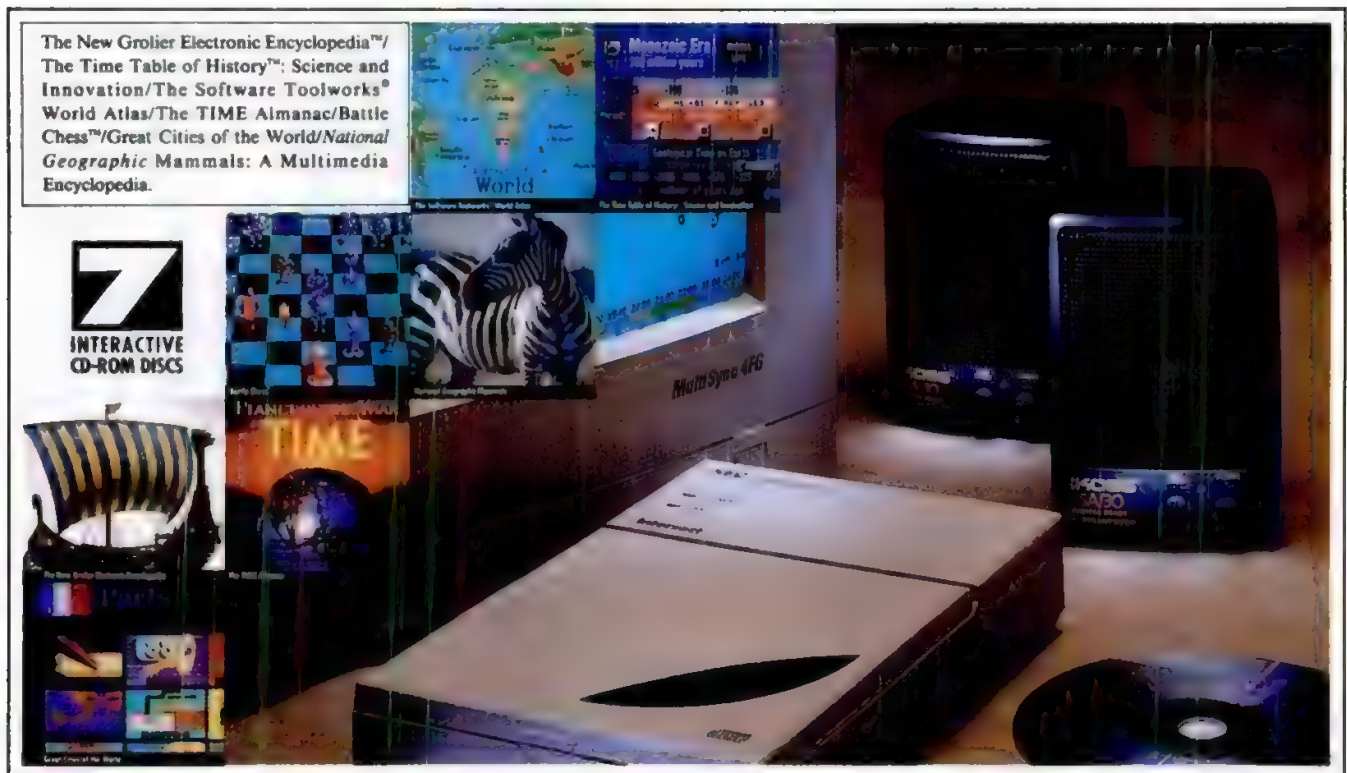
In Short: The DataDesk Switchboard is the only keyboard we reviewed that lets you move the alpha, cursor, and number pad sections into a nonstandard arrangement. A light but positive touch makes it usable in any layout. The DataDesk Turbo-101 has the same kind of keys in an unchangeable, Enhanced-style layout. If you're comfortable with that style, you will appreciate the price savings.

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FACT FILE

EDITORS' CHOICE

IBM Enhanced 101 Key Keyboard

IBM/Lexmark International Inc., 740 New Circle Rd. NW, Lexington, KY 40511; 800-426-2468, 606-232-6814.

List Price: \$217.

Dimensions (HWD): 1.8 x 19.4 x 8.3 inches.

Weight: 5 lbs.

In Short: The IBM Enhanced 101 Key Keyboard is a classic heavyweight with the most solid and positive touch you can find. The touch may be too heavy for some users, but many others will accept nothing less. IBM's reputation for reliability is confirmed by the design of this keyboard, which seems engineered to last forever.

CIRCLE 461 ON READER SERVICE CARD

a fully curved profile and (of course) the standard IBM layout. It combines extraordinarily positive-tactile feedback and is touch rated at a standard 2.5 ounces, although it seems slightly heavier than keyboards with a similar rating.

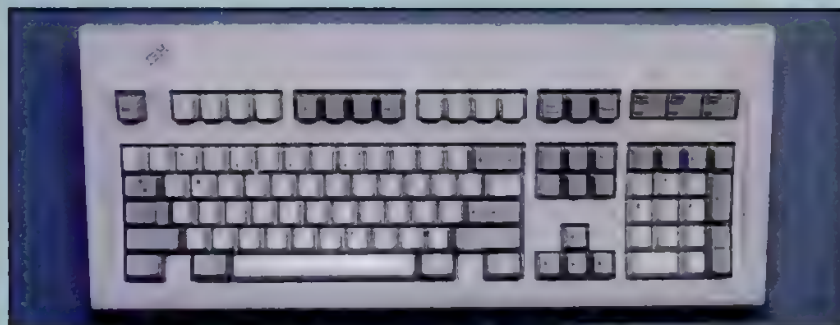
The keyboard gets its touch from its spring-activated actuators, which IBM originally designed to imitate the touch of a Selectric typewriter. The imitation is inexact, but a lot closer to a Selectric than any other PC keyboard. IBM patents have so far made this touch unique, and many users won't tolerate any alternative. IBM's keyboards also have an enviable reputation for reliability, which could explain the seemingly meager one-year warranty on parts and labor.

IBM's earlier keyboards used capacitive switches, but the Enhanced 101 Key Keyboard uses membrane-switch technology with keys that have the same kind of spring actuators as the older models. The keyboard is still noisier than most, but it makes a relatively low-pitched sound that is less irritating than the high-pitched clatter made by competing designs. The keyboard has a detachable 72-inch cable available with AT or mini-DIN connectors; you order the cable with the connector you need. (Lexmark keyboards won't work with XT machines.) The key tops consist of two layers of plastic, with the outer layer easily replaceable with custom key tops. Indicator lights perch on a panel at right.

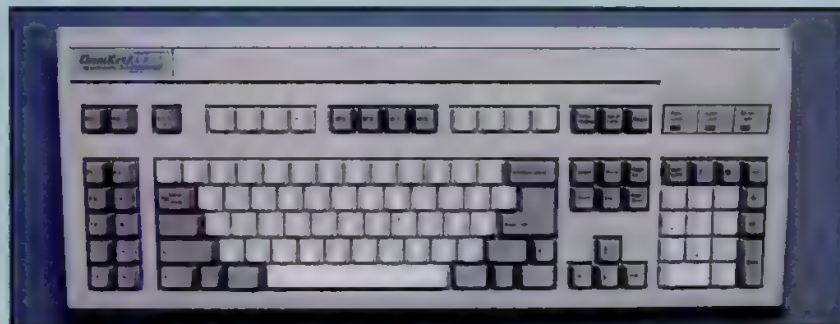
A FULL RANGE OF OFFERINGS

Lexmark also makes IBM's \$156 PS/2 Space Saving Keyboard (not reviewed here), a 15.8-inch-wide model that has the same feel and layout as an Enhanced keyboard, but without a separate num-

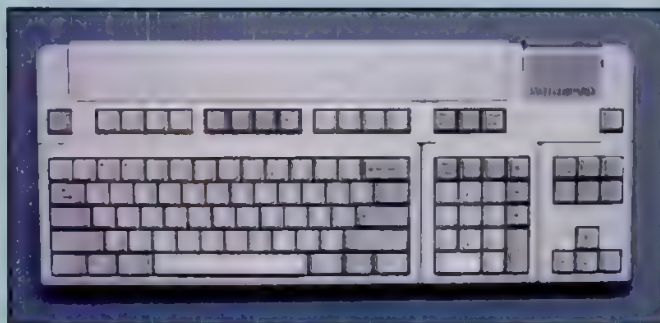
VARIATIONS ON A THEME



The **IBM Enhanced 101 Key Keyboard** is the keyboard that all the others imitate, with more or less minor modifications. The single-row Enter key and double-width Backspace are the features most likely to be modified in other layouts.



The **Northgate OmniKey/Ultra-T** improvises on the standard IBM design by including a double complement of function keys. It lets you modify IBM's layout by rearranging the Ctrl and CapsLock keys so that the Ctrl, Shift, and Alt keys are in a vertical line, as in the original IBM-XT and AT layouts.



DataDesk's elegantly finished **Switchboard** goes a step further—it can be split into three pieces and rearranged according to personal preferences. Note the Switchboard's extra Option keys, designed for the Macintosh, and key labels that display both Macintosh and PC functions.





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HARDWARE KEYBOARDS

ber pad (the pad is embedded in the alpha keyboard). Despite the PS/2 in its name, this keyboard ships with PS/1s, and a suitable Lexmark cable lets you plug it into any AT-type machine. A significant disadvantage is the lack of indicator lights for the lock keys.

IBM markets as the \$177 Selectric Touch Keyboard a lightweight (2 pounds), flat-profile, mini-DIN-connector-only model with the full Enhanced layout in a narrow body (17.7 inches wide). Its sound is more metallic and higher pitched than Lexmark's heavier models.

You can buy all these keyboards now through your IBM dealer, and around Spring 1992, you will be able to buy them directly from Lexmark. One keyboard to watch for is Lexmark's new 101 Key Quiet Touch, based on Lexmark's keyboard, the PS/2 L40 SX. It comes with a separate keypad module and a slightly modified Enhanced layout with the keys

above the inverted T in three rows instead of two. This flat-profile model uses conductive rubber-dome technology, but with a snapper and more positive feel than most other keyboards that use similar technology.

Lexmark recently announced two trackball versions of the Enhanced keyboard, one with a 16-millimeter ball near the cursor pad, the other with a 25-mm. ball next to the LED indicators. Unlike most rival models, both let you use all 101 keys as usual.

The relatively heavy touch of the Enhanced 101 Key Keyboard may not be for everyone, but this is the keyboard with the most solid feel and the most positive feedback on the market. It's compatible with virtually all AT-class machines. If you insist on a luxury keyboard, Lexmark's is the most luxurious of all.

KEY TRONIC CORP. Key Tronic MB101 PLUS

The \$115 Key Tronic MB101 PLUS looks a lot like an IBM Enhanced keyboard, but it certainly doesn't weigh as much as the classic heavyweight. At 2.1 pounds, the MB101 is one of the lighter keyboards on the market. Like the Honeywell keyboard, it uses membrane technology, but with a sheet of rubber domes that the switches press down to make the connection. (Again, this is not the same as conductive rubber-dome technology.)

The MB101 PLUS has a light touch (1.8 ounces) and a positive-tactile response when the connection is complete. But you may detect a rubbery feel if you press hard enough to make the key bottom out, and you may hear a very slight mechanical click as the key returns to its normal

REPLACEMENT KEYBOARDS: SUMMARY OF FEATURES

Products listed in alphabetical order



	ALPS MDS101	Cherry G80-1000	Cherry G80-3000	Chicony KB-5181	DataDesk Switchboard	DataDesk Turbo-101
List price	\$85.00	\$109.97	\$104.50	\$49.99	\$239.00	\$99.95
PHYSICAL FEATURES						
Case material	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic
Cord length (inches)	72	72	72	72	96	96
Number of angle settings	1	1	1	2	2	1
Pencil-tray depth (inches)	2	2	N/A	2	N/A	N/A
KEY DESIGN						
Key-switch type	Conductive rubber-dome	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Operating force required (ounces)	2	2.1	2.1	2	2.5	2.5
Key travel distance (millimeters)	3.5	4	4	4.5	3.5	3.5
KEYBOARD DESIGN						
Special keys (beyond the usual 101)	☐	☐	☐	☒	☒	☐
Exchangeable Ctrl and CapsLock (with extra key caps provided)	☐	☐	☐	☐	☒	☐
SYSTEM COMPATIBILITIES						
IBM XT	☒	☒	☒	☒	☒	☒
IBM AT/Enhanced AT	☒	☒	☒	☒	☒	☒
IBM PS/2 (Model 50 or later)	☒	☒	☒	☒	☒	☒
Stated incompatibilities	None	None	None	None	None	None
PROGRAMMABILITY						
Software-programmable	☐	☐	☐	☐	☐	☐
Hardware-programmable	☐	☐	☐	☐	☒	☐
MISCELLANEOUS						
Stated current drain	300 mA	200 mA	200 mA	100 mA	150 mA	150 mA
Optional Dvorak keyboard models	☐	☐	☐	☐	☐	☐
Optional keyboard connectors	Mini-DIN adapter (\$7.95)	Mini-DIN adapter (\$20.60)	Mini-DIN adapter (\$20.60)	Mini-DIN adapter (\$9.99)	None	None
PC manufacturers that bundle this keyboard	Info not available	Info not available	Info not available	Amkly, AST, Insight	Info not available	Info not available

N/A—Not applicable: The product does not have this feature.

HARDWARE

KEYBOARDS

PC Magazine Labs looked briefly at a not-yet-released version of Key Tronic's \$199 Trak101 keyboard, which substitutes a trackball for the inverted-T cursor pad. This elaborate design lets you use the

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Maxi Switch Tucson-101

The programmable 3.3-pound MaxiPRO uses the same key technology as the Tucson-101 but adds 10 blank keys on the left, which you can remap as function keys, and fills the space above the inverted T with five more blank keys. Keys tucked in the top row of function keys let you remap any key to any other, or program keystroke macros to any key. Macros can include pauses for user input and delays. Other keys let you set repeat rate and turn on an electronic click. Macro sets can include up to 1,800 characters, and

CONTINUES

CIRCLE 463 ON READER SERVICE CARD

you can save and download multiple macro sets to use different macros for different applications.

No mini-DIN connector is offered with the Maxi Switch MaxiPRO. Its 72-inch cable automatically adjusts itself to an XT or AT CPU, but you can override this feature if it fails (as it did with our computer).

Its one-year warranty on parts and labor seems rather light compared with the three-year warranty that accompanies the Maxi Switch Tucson-101. But its wealth of options make the MaxiPRO the ultimate in terms of user customization and control.

NMB TECHNOLOGIES INC.

NMB RT-101+ Mechanical

NMB RT-101+ Membrane

NMB Technologies markets two virtually identical-looking keyboards under the model number RT-101+. As the name implies, the \$31 RT-101+ Membrane Keyboard uses membrane switches, and the slightly more advanced \$37 RT-101+

Mechanical keyboard uses mechanical switches. Both have a layout that matches IBM's Enhanced keyboard except for an L-shaped Enter key and single-width Backspace, and both are among the least-expensive keyboards on the market.

The keyboards have a quick, light touch (2 ounces), but the Mechanical model makes the key at a slightly higher point in its travel. The Mechanical comes in silent-tactile, click-tactile, and linear-travel versions. (See the review of the Cherry keyboards for more details on linear switch types.) The silent-tactile version tested by PC Magazine Labs has precise tactile feedback, followed by a slight mechani-

REPLACEMENT KEYBOARDS: SUMMARY OF FEATURES

Products listed in alphabetical order



	Key Tronic MB101 PLUS	Maxi Switch MaxiPRO	Maxi Switch Tucson-101	NMB RT-101+ Mechanical	NMB RT-101+ Membrane	Northgate OmniKey/101
List price	\$115.00	\$150.00	\$56.00	\$37.00	\$31.00	\$89.00
PHYSICAL FEATURES						
Case material	Plastic	Plastic	Plastic	Plastic	Plastic	Plastic with metal base
Cord length (inches)	72	72	96	72	72	84
Number of angle settings	1	1	1	1	1	1
Pencil-tray depth (inches)	1.6	1	2	2	2	1
KEY DESIGN						
Key-switch type	Membrane	Conductive rubber-dome	Conductive rubber-dome	Mechanical	Membrane	Mechanical
Operating force required (ounces)	1.8	1.9	1.9	2	2	2.5
Key travel distance (millimeters)	3.8	3.8	3.8	3.6	3.6	3.5
KEYBOARD DESIGN						
Special keys (beyond the usual 101)	☐	☒	☐	☐	☐	☒
Exchangeable Ctrl and CapsLock (with extra key caps provided)	☐	☐	☐	☐	☐	☒
SYSTEM COMPATIBILITIES						
IBM-XT	☒	☒	☒	☒	☒	☒
IBM AT/Enhanced AT	☒	☒	☒	☒	☒	☒
IBM PS/2 (Model 50 or later)	☒	☒	☒	☒	☒	☒
Stated incompatibilities	AT&T 6300, IBM AT 286/6, Tandy 1000	None	None	None	None	IBM PS/2 Model 25
PROGRAMMABILITY						
Software-programmable	☐	☒	☐	☐	☐	☒
Hardware-programmable	☐	☒	☐	☐	☐	☒
MISCELLANEOUS						
Stated current drain	350 mA	200 mA	200 mA	300 mA	300 mA	200 mA
Optional Dvorak keyboard models	☒	☐	☐	☐	☐	☒
Optional keyboard connectors	Mini-DIN adapter (\$14.95)	None	Mini-DIN adapter (included)	None	None	Mini-DIN adapter (\$9.95)
PC manufacturers that bundle this keyboard	None	Info not available	ACMA, California Microsystems, Digicom, DynaSystems, Gateway 2000, IDS, Informix, Micro Express, Mini Micro, National Microsystems, PC Craft, Tandon	Info not available	Info not available	Northgate

cal click when the key cap returns to normal position. The Membrane keyboard comes in a silent-tactile version only. It also has a responsive feel, though with a slightly rubbery feeling as you press down the dome at the bottom of its travel.

Both models have curved profiles (created by using shallower key tops in the home row compared with the other rows), have 72-inch cables that exit from the center and end in an AT connector, and weigh 3.8 pounds. The Membrane model has a switch for adjusting the keyboard to IBM PC AT or XT machines.

The Mechanical model has a stepped CapsLock with a lower ridge at the right to

HARDWARE KEYBOARDS

FACT FILE

NMB Technologies Inc., 9730 Independence Ave., Chatsworth, CA 91311; 818-341-3355.

NMB RT-101+ Mechanical

List Price: \$37.

Dimensions (HWD): 1.4 x 19.2 x 8.2 inches.

Weight: 3.8 lbs.

NMB RT-101+ Membrane

List Price: \$31.

Dimensions (HWD): 1.4 x 19.2 x 8.2 inches.

Weight: 3.8 lbs.

In Short: The NMB RT-101+ Mechanical has silent mechanical switches with a light, responsive touch. This is an exceptionally low-priced keyboard that makes no significant compromise in quality. The NMB RT-101+ Membrane has a less responsive touch but is otherwise another well-made Enhanced-style keyboard. For users who want a Compaq-like touch at a low cost, it can't be beat.

CIRCLE 464 ON READER SERVICE CARD

help keep you from pressing the key by mistake. The Membrane model uses key caps with a deep dish and slight ridge for the F, J, and keypad-5 keys; the Mechanical model uses only the slight ridge. The Membrane model has printed key caps instead of the more common and longer-lasting sublimation-printed key caps with lettering below the surface.

The RT-101+ Mechanical includes a three-year warranty, while its sibling includes only a one-year warranty.

Both keyboards are well made for the price. The Mechanical version has a more responsive touch, flawed only by the extraneous click on the upstroke—its quality is in line with keyboards twice the price. If you are looking for a keyboard that comes close to the soft tactile feedback of Compaq keyboards, the NMB RT-101+ Membrane is a close match—at a much less expensive price.

NORTHGATE COMPUTER
SYSTEMS INC.

**Northgate
OmniKey/101**

**Northgate
OmniKey/Ultra-T**

Northgate is the only company that thinks more carefully about keyboard design than IBM, and many users will find its various OmniKey models the only keyboards worth using. All of its models are customizable. All use ALPS mechanical

switches with a standard 2.5-ounce operating force, fully curved profile, detachable 84-inch cables, and positive feedback via click and touch. (Northgate does not make any silent keyboards.) All have a metal base and plastic case that rank them among the heaviest and most solid-feeling keyboards on the market. If you aren't satisfied with IBM's idea of a keyboard, Northgate is the first place to look for an alternative.

Northgate sent its \$129 OmniKey/ Ultra-T and \$89 OmniKey/101 for review. The OmniKey/ Ultra-T is Northgate's most advanced design, with two sets of function keys—12 along the top and 12 on the left (the extra set of function keys make this keyboard approximately an inch or more wider than most of the others in this review). You can program the 12 on the top to act as shifted keys. For easy typing of DOS pathnames, this 5.8-pound heavyweight has an asterisk key to the outboard from the right-shift key, and puts the Backslash/Vertical key between the right-hand Ctrl and Alt. You can reverse the position of these two.

By placing the Backslash key on the bottom row, the OmniKey/ Ultra-T enjoys both a large L-shaped Enter key and an IBM-style double-width Backspace. It also adds an extra equals sign key on the keypad. The \$89 OmniKey/102, not reviewed here, is similar, but has only one set of function keys—on the left.

SUITING YOUR STYLE

The OmniKey/101, which weighs in at 4.8 pounds, matches the layout of IBM's

Northgate OmniKey/ Ultra-T	Tandy 101-Key Enhanced Keyboard
\$129.00	\$99.95
Plastic with metal base 84	Plastic with metal base 72
1	1
1	1.3
Mechanical	Membrane
2.5	2
3.5	3.8
■	□
■	□
■	■
■	■
■	■
IBM PS/2 Model 25	None
■	■
■	■
200 mA	500 mA
■	■
Mini-DIN adapter (\$9.95)	Mini-DIN adapter (\$4.95)
Northgate	Tandy

ENDS

FACT FILE EDITORS' CHOICE

Northgate Computer Systems Inc., 7075 Flying Cloud Dr., Eden Prairie, MN 55344; 800-548-1993, 612-943-8181.

Northgate OmniKey/101

List Price: \$89; mini-DIN adapter, \$9.95

Dimensions (HWD): 1.8 x 18.6 x 7.9 inches.

Weight: 4.8 lbs.

Northgate OmniKey/ Ultra-T

List Price: \$129; mini-DIN adapter, \$9.95

Dimensions (HWD): 1.8 x 20.6 x 8.1 inches.

Weight: 5.8 lbs.

In Short: Both of these keyboards are highly customizable and among the best designed on the market, with convenience features unmatched elsewhere. A positive touch makes the OmniKey line comfortable to use, and a metal base enhances the keyboards' stability. A five-year warranty and 60-day money-back guarantee add to their attractiveness.

CIRCLE 465 ON READER SERVICE CARD

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US Army



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- MAXTOR 213 Meg IDE HD (15 MS) (150,000 hr. MTBF)
- 101 Keyboard
- EPS Non Interlaced 14" Color Monitor 1024x768 SVGA .28 Dot Pitch
- 1 Meg SVGA Card 1024x768 w/Sierra DAK chip (1 Meg for 256 Colors at 1024x768) (1 Meg for 65,536 Colors at 800x600)
- MS Windows 3.0 w/Logitech 3-Button, 400DPI Mouse
- MS DOS 5.0
- Systems User's Manual
- One Year Warranty/ On-Site Service
- 60 Day Money Back Guarantee
- Call for Customizing Options

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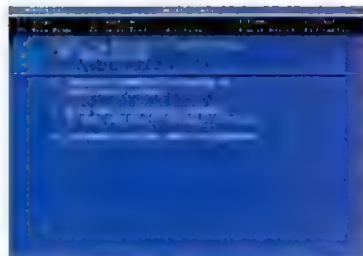
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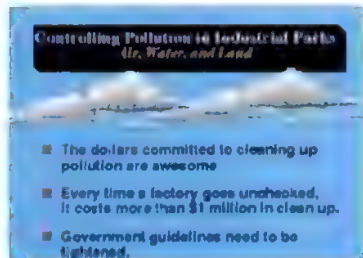
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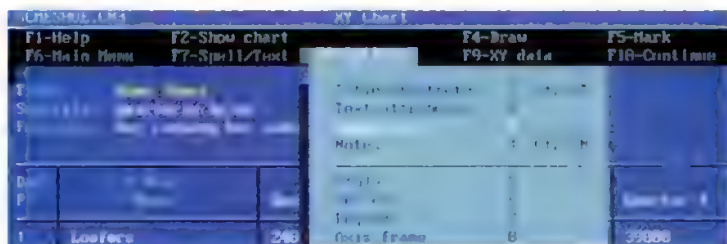
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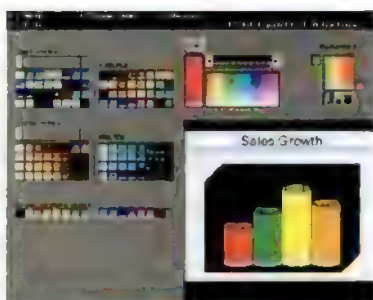
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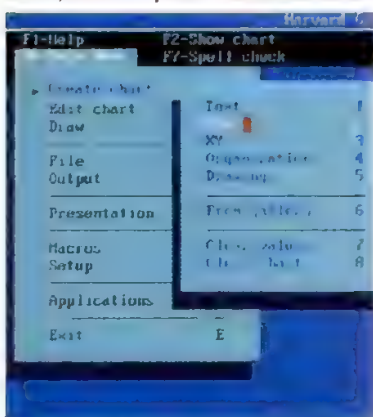
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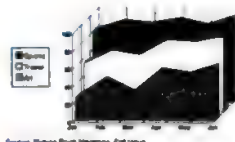


Look familiar? It should. It's Harvard Graphics.



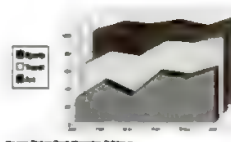
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Enhanced keyboard, with function keys on top, a single-row Enter key, and double-width Backspace. This, like all Northgate keyboards, lets you rearrange the left-hand Ctrl and CapsLock keys so that the Ctrl, Shift, and Alt keys run from top to bottom in a single line, as in the original IBM PC-XT and AT layout. (Replacement key caps and a keypuller come in the package.)

With the two Northgate keyboards reviewed (as well as any in the OmniKey line), you can program the colon key to generate a colon instead of a semicolon when shifted, and you can "lock" the period and comma keys so that their shifted states produce a period and comma instead of angle brackets. (The Ultra-T and 102 models include a separate angle-bracket key between the left Shift and Alt keys.) You have to press **PrtSc** twice to print the screen, to avoid the annoyance of unwanted screen prints.

All these features—plus key rate—can be set directly from the keyboard or via a utility program available from Northgate or Northgate's CompuServe forum. You can also select the keyboard for Dvorak layout, or set it via DIP switches for compatibility with AT&T 6300 and Tandy 1000 models that won't work with some other third-party keyboards. All Northgate keyboards work at top speed with Novell networks.

A plastic dust cover that comes in the box helps preserve these keyboards for the five years covered in the warranty—not to mention the 60 days covered by the money-back guarantee. The dust cover is one of dozens of small touches that make Northgate's OmniKey products the best values on the market and the one keyboard line that gives you options and conveniences you can't find anywhere else.

RADIO SHACK/TANDY CORP.

Tandy 101-Key Enhanced Keyboard

No IBM-style keyboard looks more like the IBM Enhanced keyboard than the \$99.95 Tandy 101-Key Enhanced Keyboard, and none has a touch that more closely resembles IBM's positive-tactile feel—although with a rated operating force of 2 ounces, the Tandy's touch is somewhat lighter than IBM's and most other desktop keyboards. Like IBM's, Tandy's

HARDWARE KEYBOARDS



Tandy 101-Key Enhanced Keyboard
Radio Shack/Tandy Corp., 1800 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.
List Price: \$99.95; mini-DIN adapter, \$4.95.
Dimensions (HWD): 1.8 x 18.5 x 8 inches.
Weight: 4 lbs.

In Short: This is a solidly built substitute for an IBM keyboard, with similar spring-actuated switches and an excellent IBM-style touch. The Tandy 101-Key Enhanced Keyboard will appeal to many users who want a keyboard that feels much like Big Blue's but does not cost as much.

CIRCLE 486 ON READER SERVICE CARD

keyboard is built like a battleship, and its metal base and 4-pound weight give it stability on the desktop. Its 72-inch cable comes out of the box with an AT connector, but any Radio Shack store can sell you a mini-DIN adapter (\$4.95).

As with IBM's latest keyboards, Tandy's 101-Key Enhanced Keyboard uses a spring mechanism to trigger its membrane switches—technologies that combine positive touch and high reliability. In appearance, Tandy's Enhanced keyboard virtually matches IBM's Enhanced keyboard, right down to the fully curved profile. As on IBM models, the Enter key is one row high, and the Backspace is double width. The one obvious difference is Tandy's placement of indicator lights on the lock keys themselves instead of on a panel on the upper right.

Like many replacement keyboards, early versions of Tandy's model slowed down when connected to a Novell network. The latest model is fully compatible with *NetWare*. Tandy's keyboard automatically senses whether it's attached to an IBM PC-XT- or AT-style CPU and works with both. You can't, however, override this auto-sensing if it fails. Tandy offers a one-year warranty on parts and labor for its keyboard.

The Tandy 101-Key Enhanced Keyboard is as solidly made as IBM's and has a lighter touch that many users will enjoy. Besides the slight difference in touch, the major difference between the Tandy and IBM models in this review is that the Tandy costs a lot less—and that might be the deciding factor for many users. ■

Angela Gunn is an editorial assistant at PC Magazine. Edward Mendelson is a contributing editor of PC Magazine.

Computers, FCC Class A, Class B, and You — or When is it better to get a B than an A?

You need to know the difference between computers that meet the FCC class B radio frequency emissions standards and those that meet only the Class A standards.

Computers emit radio signals in their operation. Because these signals may cause interference to radio and television reception, the marketing and the use of computers is regulated by the Federal Communications Commission. Under federal rules, computer users are responsible for remedying interference, including interference in neighboring homes.

Computers certified by the FCC as meeting the Class B standard are less likely to cause interference to radio and TV reception than those that have been verified by the manufacturer or importer to the Class A standards. Only Class B certified computers may be advertised, sold, or leased for use in residences. A similar regulatory program applies in Canada.

Buyers seeking computers for use in homes (including offices at home) should shop for computers and peripherals which have been Class B certified. These devices carry a label with an FCC ID number. Both new and used Class A verified devices may be sold only for use in commercial and industrial locations. Signals from computers are more likely to be masked by electrical noise from other equipment in such an environment. These areas are also likely to have fewer radios and TVs. Accordingly, equipment marketed only for use in these locations may meet the less rigorous Class A standard. Class B certified equipment may be marketed for use in residences as well as commercial and industrial locations.

As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.



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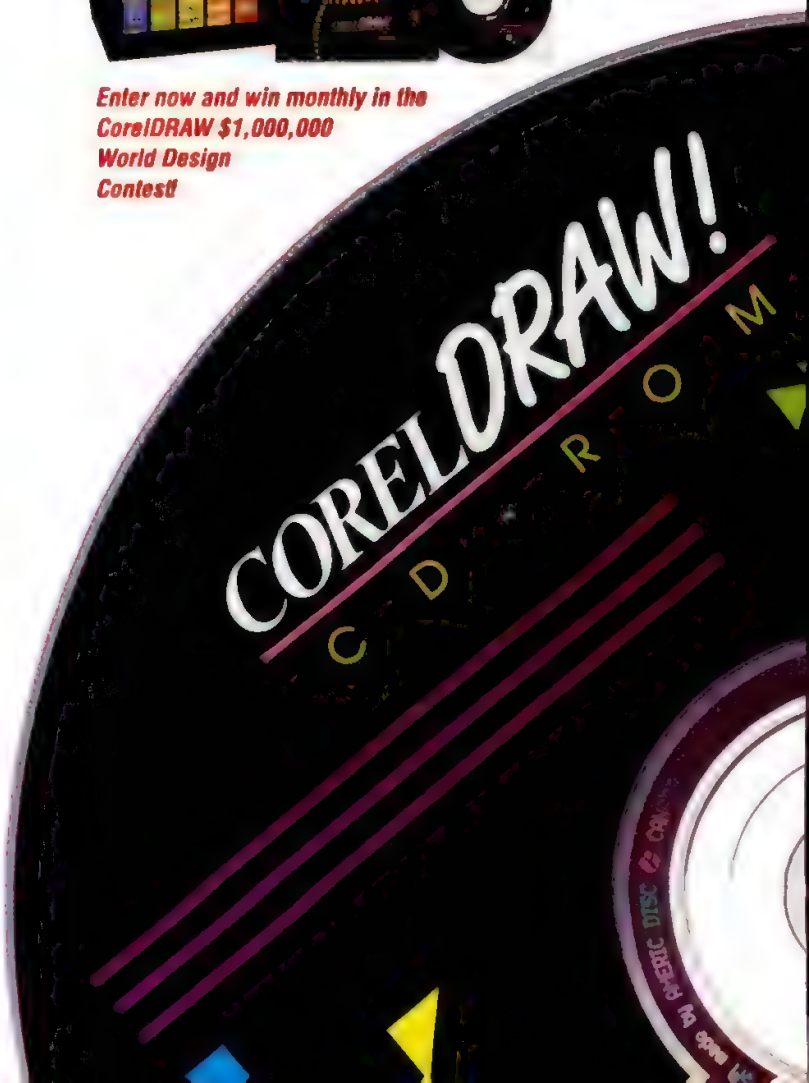
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CIRCLE 177 ON READER SERVICE CARD

by
Joe Salemi

Advisor

TRACKING DOWN SMARTKEY

I recently purchased *SmartKey* 5.2 by Software Research Technologies, and I can't read the program disk on my 386 machine. I've tried reading the directory, copying, XCOPYing, DISKCOPYing, but I always get the same "cannot read disk" error message.

I wrote to the company at the address printed in the manual, but the letter was returned. My phone call attempts have reached disconnected numbers. Do you know of a current address or phone number for the company?

Paul Andros
Lakeland, Florida

PC Software Research Technologies went out of business a while ago. After changing hands a couple of times, *SmartKey* is now owned and marketed by No-Brainer Software (1135 E. South Union Ave., #220, Midvale, UT 84047; 800-748-4499, 801-561-3834).

But the first thing to do if you get a bad disk in a new package of software is to take it right back to the dealer and ask for a replacement. *SmartKey* is currently in Version 6.0g; if your purchase was very recent, you may want to ask the dealer for the latest version. In addition to providing keyboard macros, this \$89.95 version includes cut-and-paste, support for custom menus, keyboard locking, encryption, and screen blanking.

No-Brainer will upgrade versions of *SmartKey* 5.2 and older for \$62.96; Versions 5.3 and later cost \$50 to upgrade. The latest version is also fully compatible with DOS 5.0. A network version is available for \$195 and is licensed for one server and five nodes. Additional node software (with documentation) can also be purchased (call for pricing).

MOUSE DRIVER INCOMPATIBILITIES

A couple of years ago I purchased the program *Personal Ancestry File (PAF)*, Version 2.1, from the LDS Church. I origi-

- **TRACKING DOWN SMARTKEY:** How to contact the new owners of SMARTKEY.
- **MOUSE DRIVER INCOMPATIBILITIES:** Updating your Logitech drivers.
- **BASEBALL STATISTICS:** Six packages to help you manage baseball stats on your PC.
- **DACEASY SUPPORT:** How to get in touch with DacEasy.
- **UTILITIES BY MAIL:** How to obtain PC Magazine utilities when you don't have a modem.

nally ran the program without a mouse, but I was surprised to see the added flexibility I obtained by simply installing a mouse on the system. I didn't even have to reinstall *PAF*; it just accepted the mouse and automatically modified its displays accordingly.

I have now upgraded to Version 2.2, and I am disappointed to find that *PAF* no longer responds correctly to my mouse, a Logitech TrackMan. How can I find out if there is a new driver available that would solve this problem?

James W. Womack
Las Cruces, New Mexico

PC Logitech prides itself on its Microsoft mouse compatibility and is always updating its drivers to maintain it. The latest versions of the TrackMan and mouse drivers are always available on Logitech's BBS at 415-795-

0408. If you don't have access to a modem, you can contact Logitech directly at 800-231-7717 to obtain the latest drivers for a small service fee.

BASEBALL STATISTICS

I keep the stats of a baseball team. Can you help me track down a program to handle this task?

Felix M. Rios
Sabana Seca, Toa Baja
Puerto Rico

PC The first cold snap of winter has arrived as I write this, so it's tempting to think of a warm spring day out on the baseball diamond and to start planning for the new season. I found a number of packages, both commercial and shareware, that automate the process of keeping statistics for individual players, teams, or whole leagues.

Baseball Statbooks (RJL Systems, 106 New Haven Ave., Milford, CT 06460; 203-878-0376; \$69) is a commercial program that lets you sort by any statistic and has user-defined as well as predefined reports. The number of players and teams is limited only by disk space.

File Clerk Baseball (Landrum Software Inc., 2646 SW Mapp Rd., #202, Palm City, FL 34990; 407-286-1324; \$79) is geared toward one team, though it keeps league standings as well as individual player statistics. You can evaluate individual player performance and past games through the history files, and print batting order sheets.

Baseball League Statistics (Mighty Byte Computer Inc., 6040A Six Forks Rd., Twin Forks Office Park, #223, Raleigh, NC 27609; 800-237-7072, 919-846-0345; \$40) keeps track of batting, fielding, and pitching stats and supports both individual teams and leagues.

Complete Team Series (Score Book Software, P.O. Box 3677, Estes Park, CO 80517; 303-586-0781; \$125) has a variety of statistics functions, including scouting and practice sessions, and has support

Statistics for 1990 League

PLAYER	TM	BA	SLG	OBP	AVG	R	H	HR	RBI	SO	SB	CS	IP	W	L	ERA	SHO	SV	WHIP	WAR
ROBINSON	1	.283	.451	.343	.300	14	45	10	25	100	10	5	150	12	8	3.21	1	0	1.15	4.5
MILLER	2	.265	.438	.339	.279	12	42	9	22	95	8	4	140	10	7	3.45	2	1	1.20	4.2
JACKSON	3	.271	.442	.345	.292	13	43	11	23	98	11	6	145	11	9	3.38	0	0	1.18	4.6
SMITH	4	.289	.458	.351	.305	15	46	12	26	102	12	7	150	13	10	3.25	1	1	1.16	4.8
WILLIAMS	5	.275	.440	.340	.285	11	41	8	21	92	9	5	135	9	6	3.50	0	0	1.22	4.1
DAVIS	6	.260	.425	.330	.270	10	38	7	19	88	7	3	130	8	5	3.60	0	0	1.25	3.9
WALKER	7	.290	.460	.355	.310	16	47	13	27	105	13	8	155	14	11	3.15	2	2	1.14	5.0
ANDERSON	8	.278	.445	.348	.295	13	44	10	24	99	10	6	148	12	9	3.30	1	0	1.17	4.7
THOMAS	9	.285	.455	.350	.302	14	45	11	25	101	11	7	149	13	10	3.28	0	0	1.16	4.9
LEE	10	.272	.435	.335	.282	11	40	9	20	90	8	4	132	10	7	3.48	0	0	1.21	4.3
WATSON	11	.280	.450	.345	.298	12	43	10	23	97	9	5	142	11	8	3.35	1	1	1.18	4.6
COLEMAN	12	.270	.430	.330	.275	10	39	8	18	85	7	3	128	9	6	3.55	0	0	1.23	4.0
PEREZ	13	.282	.452	.347	.299	13	44	11	24	100	11	7	147	12	9	3.29	0	0	1.17	4.8
ROBERTS	14	.273	.438	.332	.280	11	41	9	21	93	8	4	133	10	7	3.49	0	0	1.21	4.2
TURNER	15	.288	.458	.352	.308	15	46	12	26	103	12	7	151	14	11	3.18	2	2	1.15	5.1
PHILLIPS	16	.276	.442	.340	.290	12	43	10	23	98	10	6	146	11	9	3.32	1	0	1.19	4.7
SCOTT	17	.284	.454	.349	.303	14	45	11	25	101	11	7	148	13	10	3.27	0	0	1.16	4.9
BROWN	18	.271	.435	.331	.278	10	40	8	19	89	7	3	131	9	6	3.52	0	0	1.22	4.1
WRIGHT	19	.286	.456	.351	.306	14	46	12	26	102	12	7	150	14	11	3.19	2	2	1.15	5.0
MARTIN	20	.274	.440	.333	.283	11	41	9	20	94	8	4	134	10	7	3.47	0	0	1.20	4.3
ANDERSON	21	.281	.451	.346	.297	13	44	10	23	99	10	6	145	12	9	3.31	1	1	1.18	4.8
THOMAS	22	.279	.443	.337	.286	12	43	9	22	96	9	5	141	11	8	3.36	0	0	1.19	4.6
LEE	23	.283	.453	.348	.301	14	45	11	25	100	11	7	149	13	10	3.26	0	0	1.16	4.9
WATSON	24	.275	.439	.334	.281	11	41	8	20	91	8	4	132	10	7	3.46	0	0	1.20	4.2
COLEMAN	25	.287	.457	.350	.304	15	46	12	26	104	12	7	152	14	11	3.17	2	2	1.14	5.2
PEREZ	26	.272	.436	.332	.279	10	40	8	19	87	7	3	129	9	6	3.53	0	0	1.23	4.0
ROBERTS	27	.285	.455	.349	.305	14	45	11	25	101	11	7	148	13	10	3.28	0	0	1.17	4.9
TURNER	28	.273	.437	.331	.280	11	41	9	20	92	8	4	133	10	7	3.48	0	0	1.21	4.2
PHILLIPS	29	.289	.459	.353	.309	16	47	13	27	106	13	8	154	15	12	3.16	2	2	1.14	5.3
SCOTT	30	.277	.441	.335	.284	12	43	10	23	97	10	6	144	11	9	3.33	1	1	1.18	4.7
BROWN	31	.284	.454	.347	.302	14	45	11	25	100	11	7	147	13	10	3.27	0	0	1.16	4.9
WRIGHT	32	.274	.438	.333	.282	11	41	9	20	93	8	4	134	10	7	3.47	0	0	1.20	4.3
MARTIN	33	.286	.456	.351	.306	15	46	12	26	103	12	7	151	14	11	3.18	2	2	1.15	5.1
ANDERSON	34	.276	.440	.334	.283	12	43	9	22	96	9	5	142	11	8	3.34	0	0	1.19	4.6
THOMAS	35	.282	.452	.346	.298	13	44	10	23	99	10	6	146	12	9	3.30	1	1	1.18	4.8
LEE	36	.278	.442	.336	.285	12	43	9	22	95	9	5	140	11	8	3.37	0	0	1.19	4.6
WATSON	37	.283	.453	.348	.301	14	45	11	25	100	11	7	149	13	10	3.29	0	0	1.17	4.9
COLEMAN	38	.275	.439	.332	.281	11	41	8	20	91	8	4	132	10	7	3.49	0	0	1.20	4.2
PEREZ	39	.287	.457	.350	.304	15	46	12	26	104	12	7	152	14	11	3.17	2	2	1.14	5.2
ROBERTS	40	.272	.436	.332	.279	10	40	8	19	87	7	3	129	9	6	3.53	0	0	1.23	4.0
TURNER	41	.285	.455	.349	.305	14	45	11	25	101	11	7	148	13	10	3.28	0	0	1.17	4.9
PHILLIPS	42	.273	.437	.331	.280	11	41	9	20	92	8	4	133	10	7	3.48	0	0	1.21	4.2
SCOTT	43	.289	.459	.353	.309	16	47	13	27	106	13	8	154	15	12	3.16	2	2	1.14	5.3
BROWN	44	.277	.441	.335	.284	12	43	10	23	97	10	6	144	11	9	3.33	1	1	1.18	4.7
WRIGHT	45	.284	.454	.347	.302	14	45	11	25	100	11	7	147	13	10	3.27	0	0	1.16	4.9
MARTIN	46	.274	.438	.333	.282	11	41	9	20	93	8	4	134	10	7	3.47	0	0	1.20	4.3
ANDERSON	47	.286	.456	.351	.306	15	46	12	26	103	12	7	151	14	11	3.18	2	2	1.15	5.1
THOMAS	48	.276	.440	.334	.283	12	43	9	22	96	9	5	142	11	8	3.34	0	0	1.19	4.6
LEE	49	.282	.452	.346	.298	13	44	10	23	99	10	6	146	12	9	3.30	1	1	1.18	4.8
WATSON	50	.278	.442	.336	.285	12	43	9	22	95	9	5	140	11	8	3.37	0	0	1.19	4.6

Stats are carried by team
Hit ENTER to Select Player, HIT ESC to Main Menu

Figure 1:
Baseball Statpak,
one of many
shareware
baseball
statistics
programs,
features a point-
and-shoot
interface.

for team administration. Score Book also sells the *Complete League Series* (\$245), which supports scheduling, team and league statistics, and playing assignments.

A number of shareware packages are available for downloading in Library 9—Sports & Chance on the IBMNEW Forum on CompuServe, as well as direct from the authors or from one of the shareware distribution services. *Game By Game* (Computer Sports International, 330 SW 43rd St., #282, Renton, WA 98055; available for downloading on CompuServe) is a simplified program that will track 17 batting, 14 pitching, and 4 fielding statistics for each of 80 players on a team. The filename is GBG.ARC.

Baseball Statistical Manager (Caboose Software Engineering, 2921 Bluff Point Ln., Silver Spring, MD 20906; 301-460-1437; \$10 donation, \$25 for full registration) keeps up to 47 different statistics on up to 30 players per team. A commercial "deluxe" version, currently under development, will be free to registered users of the shareware version. *BSM* can be found in the self-extracting archive BSM261.EXE.

Finally, there's *Baseball Statpak* (Federal Hill Software, 3722 Greenway Ln., P.O. Box 765, Owings Mills, MD 21117; 410-356-5592; \$30 registration), which can cover up to 250 players total on 12 different teams per league (the number of different leagues is governed by disk space). You can track 14 different stats for each player. The program has a point-and-shoot interface and generates several reports. *Baseball Statpak's* screen is

shown in Figure 1. The shareware version is available as BASBE4.ZIP; registered users receive an enhanced version.

If you keep stats for other types of sports teams, you may still want to contact these companies, many of which also sell versions customized for other sports.

DACEASY SUPPORT

In April 1990, while in the United States, we bought *DacEasy Accounting*, Version 4.03, which was then the current version. After installing and learning it, we began using the software for a home-brokerage and rental business.

We encountered some important deficiencies, and our complaints by fax and letter were, at first, acknowledged by the *DacEasy* export manager. However, these contacts brought no solution or update, and later on, the manager referred us for a "cheap update" to the UK and/or the German importers (who didn't have any version later than 3.1). Since the end of 1990 we haven't received any response at all.

Is *DacEasy* still in business? If so, could you advise us of the company's current address and fax or telephone number?

R. Smit
Bennekom, Netherlands



DacEasy is still very much in business, and the current version of its flagship product *DacEasy Accounting* is 4.2. Problems with supporting foreign customers are not unique to this company, owing to differences in

markets and import/export laws. Until the company's overseas organizations catch up with the latest version, *DacEasy* can be contacted in the United States at 17950 Preston Rd., #800, Dallas, TX 75252; 800-322-3279, (fax) 214-248-0205, 214-250-3752.

UTILITIES BY MAIL

For those of us who lack access to CompuServe or PC MagNet, is there any way to obtain those wonderful utilities you frequently add to your growing list?

John E. Daly
Providencia, Santiago
Chile



Yours is one of the most common questions I receive. The only way to obtain the executable versions of the utilities that appear in *PC Magazine* is from PC MagNet or one of the many BBSs that carry them.

You can, however, obtain a printout of the full source code by mail, if you're inclined to type it in and compile it yourself. Send a postcard with the name of the utility and your address to Katherine West, Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; (no phone calls please).

ADVISOR UPDATE

In the discussion of organization chart programs in the September 10, 1991, column, the phone number for Banner Blue Software should have read 510-794-6850. The price for *Org Plus Advanced* has been reduced to \$99.99.

A number of readers have written to tell me that there is indeed an RPG III compiler for DOS (discussed in the October 29, 1991, column). APC/4++ (Native Software, 9210 Arboretum Pkwy., #200, Richmond, VA 23236; 804-330-7100; \$2,195) is an AS/400 emulator for the IBM PC that supports RPG II, RPG III, and RPG 400. RPG/4++ (\$695 for the runtime version) compiles RPG II, RPG III, and RPG 400 programs to run under DOS.

ASK THE ADVISOR

Send your question to Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload it to PC MagNet (see the instructions for joining on page 10 of this issue). We regret that we're unable to acknowledge submissions or answer letters individually. ■

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by
Jeff Prosis

Tutor

COPY WITHOUT SWAPPING

I used DRIVER.SYS to create a second logical device name for each floppy in my system—a 1.2MB in A: and a 1.44MB in B:—so I can easily copy files on one disk to another disk using the same drive. However, when I type a command such as COPY B:.* E: (E: is the alias for drive B:), DOS reads only one file—sometimes less—before asking me to insert a disk in drive E:. After transferring that information, it requests the B: floppy and so on, until I finally press Ctrl-C to break out of the loop. What am I doing wrong?

Edward Olshewski
Allen Park, Minnesota

PC Your problem isn't with DRIVER.SYS; it's with the COPY command. When you include a wildcard character in a filename, COPY copies the files one at a time, requiring a separate disk access for each part of the process. If you use *.* to copy the contents of a directory containing say, 10 files, COPY requires you to swap disks no fewer than 20 times—more if any files exceed 64K. DRIVER.SYS merely creates the E: alias for drive B:, allowing COPY to work. It has no control over when or how often access to either logical drive occurs.

COPY copies files from drive B: to E: by reading the entire contents of one file, if it requires less than 64K, from B: into memory; if it requires more than 64K, COPY reads just the first 64K. Next, COPY attempts to write the information out to E:. At this point, DRIVER.SYS, realizing that B: and E: represent the same physical device, prompts you to remove the current disk and insert the one for drive E:. After copying the data, COPY returns to drive B:, either to read the next file or anything still remaining from the first. Once again, DRIVER.SYS intervenes, asking you to reinsert the disk for drive B:. The process repeats until all the files have been copied to the destination one by one.

- **COPY WITHOUT SWAPPING:** Why you have to swap floppies endlessly when copying multiple files between disks in the same drive and how to avoid it.
- **CUSTOMIZING THE DOS 5.0 EDITOR:** How to modify the file-open dialog box in the DOS 5.0 editor to display files with any extension.

Obviously, this is a highly inefficient way to copy files. You can skirt the problem, though, using XCOPY rather than COPY. Introduced in DOS 3.2, XCOPY offers several advantages over COPY. First, it uses all available memory below 640K to buffer file data read from the source. Even if you copy a file larger than 64K, XCOPY can handle it all in one gulp, provided the size remains less than available memory. Furthermore, unlike COPY, XCOPY will read several files into memory at once. If you copy a whole directory full and the aggregate length comes to less than the amount of memory available, XCOPY completes the job in one operation. When using dual drive aliases but only a single physical device to copy files, this reduces the number of disk changes to the bare minimum.

XCOPY performs a lot of other functions COPY doesn't, too. Its /S switch, for example, allows you to transfer all files from a specified directory *and its descendants*—a useful feature for copying entire disks. If you want to duplicate all files and subdirectories from a 360K disk in drive A: onto a 720K disk in drive B:, type

```
XCOPY A: B: /S /E
```

The /E switch tells XCOPY to replicate empty subdirectories, too. You couldn't do this using DISKCOPY, because of its inability to work with different disk types simultaneously. Also, under DISKCOPY, files that are fragmented on the source disk will be that way on the destination disk. XCOPY, on the other hand, places them in contiguous sectors.

Note that to copy hidden or system files, you'll have to strip the attributes off them first using the ATTRIB command. XCOPY ignores volume labels, too. If the destination disk requires one, the easiest option is to add it manually with the LABEL command.

For those wondering why you might need DRIVER.SYS to copy files from one disk to another, consider this. Say your PC has two floppies—a 1.44MB A: drive and a 1.2MB B: drive—and you want files copied from one 1.44MB disk to another. Using DISKCOPY, it's no problem, since typing

```
DISKCOPY A: A:
```

causes the program to prompt you for the source or destination disk as needed. Typing

```
COPY A:ANYFILE.DOC A:
```

however, returns the error message "File cannot be copied onto itself." The reason? COPY lacks the capacity to prompt for the disk switch, so—seeing the same source and destination—it assumes you made a mistake. XCOPY behaves the same way. You can get around the problem by using DRIVER.SYS to create a second drive letter for A:, which you then use as the copy destination. Suppose A: refers to a 1.44MB floppy and D: currently represents the system's highest defined drive letter. Adding

```
DEVICE=DRIVER.SYS /D:0 /F:7
```

to CONFIG.SYS creates a drive E:, which

refers to the same physical drive as A:. The /D:0 switch causes DRIVER.SYS to assign the new logical drive to physical drive number 0—a 1.44MB floppy, as indicated by the /F:7. Then, the command

```
COPY A:ANYFILE.DOC E:
```

becomes perfectly legitimate. COPY is satisfied, because now you can enter different drive letters for the source and destination. DRIVER.SYS works behind the scenes, prompting you to swap disks as needed to carry out the copy operation.

CUSTOMIZING THE DOS 5.0 EDITOR

I use the DOS 5.0 editor constantly and find it a great tool, with one exception: The file-open dialog box defaults to *.TXT. I work on files with a variety of extensions, so I frequently end up entering the filename manually. Can I change the default from *.TXT to *.*?

John N. Ridgely
Rockville, Maryland

PC Yes, if you don't mind doing a little work with DEBUG. The default file specification, *.TXT, is hard-coded into QBASIC.EXE, the program that executes when you start the editor. Making this modification requires eight steps:

- **Make a backup!** Go to the directory containing your DOS files and you should find QBASIC.EXE. Copy it to a file with a different name, say QBASIC.BAK—in case something goes wrong.
- **Rename QBASIC.EXE QBASIC.BIN.**
- **To start DEBUG and load the program file,** enter DEBUG QBASIC.BIN at the DOS prompt.
- **Using the S (for Search) command,** find the segment and offset where the string "*.TXT" (with an *uppercase* extension) begins. We'll explore exactly how after looking at the remaining steps.
- **Substitute the new file specification** for the current default, *.TXT. For example, suppose your search turns up the segment:offset pair 4678:C76F and you want the dialog box to display *.*; you would enter the DEBUG command

```
E 4678:C76F "*.*,0
```

making sure to include the trailing zero.

- **Save the modified version back to disk** by typing W (for Write) at the prompt.

SOLUTIONS

TUTOR

HOW TO CHANGE THE DOS 5.0 EDITOR'S DEFAULT FILE SPECIFICATION

```
C:\DOS>debug qbasic.bin
-I
AX=0000 BX=0003 CX=E34F DX=0000 SP=FFEE BP=0000 SI=0000 DI=0000
DS=1678 ES=1678 SS=1678 CS=1678 IP=0100 NV UP EI PL NZ NA PO NC
1678:0100 4D          DEC     BP
-B 1678:0100 FFFF "*.TXT"
-B 2678:0000 FFFF "*.TXT"
-B 3678:0000 FFFF "*.TXT"
-B 4678:0000 E44F "*.TXT"
4678:C76F
-B 4678:C76F "*.*,0
-W
-Q
C:\DOS>
```

Figure 1: This example shows the DEBUG steps needed to modify the default filespec in EDIT's file-open dialog box. Register contents and search locations may vary.

- **Hit Q to quit.**
 - **Change QBASIC.BIN back to QBASIC.EXE.** When you next start the editor and select File Open, the dialog box should reflect your new default filename.
- Normally, using DEBUG to find a

Finding no text on this attempt, I repeated the search beginning at offset 0 in the next higher segment (2678) and again in segments 3678 and 4678, finally locating the string at 4678:C76F. Notice I didn't search all of the final segment—only up to offset E44F. This is because of QBASIC.EXE's length: 254,799 bytes, or slightly less than four full 64K segments. To keep from searching memory holding no program code or data, I calculated where to stop by adding 100h to the CX register's initial value (E34F as reported by the R command). Had the string not turned up, I would have concluded that this copy of QBASIC.EXE had already been patched.

Once the string was located, I used

```
E 4678:C76F "*.*,0
```

If you don't mind using
DEBUG, you can
modify the default
filespec in the
DOS 5.0 editor.

string presents no special problems, but QBASIC—at over 64K—will probably require you to search segments beyond the one DEBUG first selects when it comes up. Figure 1 gives a typical example, showing the commands I gave, along with DEBUG's responses.

After starting DEBUG, I issued the R command to display the contents of all CPU registers. Using the value in the CS register (1678 in my case) as the beginning search location, I executed the command

```
S 1678:0100 FFFF "*.TXT"
```

to find all occurrences of the specified text past offset 100h of segment 1678. Why start at offset 100h? Because DEBUG loads the file there.

to substitute the new file specification for the old one, saving the modified file back to disk with the W command. You can use the same procedure to alter QBASIC.EXE shipped with any brand of DOS 5.0 or, conceivably, with future releases. Modify the segment and offset values accordingly, though, since they vary from version to version and PC to PC.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for instructions).

by
Neil J. Rubenking

User-to-User

THE ULTIMATE ITERATING BATCH FILE

If you're looking for an internal DOS command-only loop counter for batch files, try ITER.BAT (Figure 1). ITER takes up to 11 command line arguments in the form

```
ITER num command [arg1 ... arg9]
```

where *num* is a number (0 through 99,999,999) indicating how many iterations to run, *command* is the command you want repeated, and *arg1* through *arg9* are arguments to *command*. So the line

```
ITER 25 ECHO My, what a lot of  
messages.
```

will print the message, "My, what a lot of messages," on the screen 25 times.

ITER.BAT uses these resources:

- 34 bytes of environment space, plus 8 bytes for each digit in *num* (%iteri% and %iterj% are reset before %iterdone% is set).
- 1 directory entry and 2 files, plus 1 file for each digit in *num*.
- About 5K of memory, plus about 2.5K for each digit in *num*.

Not bad for a program that will run almost a hundred million iterations of your command! Of course that's ludicrous, but if you don't use such large numbers, not all of the resources will be used, and it's only a few extra lines of code for each digit.

ITER.BAT first creates a directory using the *num* parameter on the command line (after making sure that the directory doesn't already exist), then creates a file in the new directory, again using the first parameter. It then determines the value of each digit in *num* by masking the remaining digits with wildcards and testing for file existence with the test digit set to each of the characters 0 through 9. When the file is found, an environment variable is set with the character that was successful. When the combined variables are used successfully in an IF EXIST command, the parsing of the number is complete.

■ THE ULTIMATE
ITERATING BATCH FILE:
Using only internal DOS
commands, this batch
file repeats the command
of your choice up to
99,999,999 times.

Next, a batch file (ITER_RUN.BAT) containing the command and its parameters is created. Up to eight other batch files (ITER_1.BAT through ITER_8.BAT, one for each digit in *num*) are also created. The first of these CALLs the second, the second CALLs the third, and so on. The last one calls ITER_RUN.BAT. Each of these batch files passes along the current value for its corresponding digit and that of the previous batch files, so that ITER_RUN.BAT is CALLED with all the digits corresponding to the current iteration minus 1 (the first iteration is 0). When these digits equal the original *num* parameter, an environment variable (%iterdone%) is set to 1, all subsequent CALLs fail, and processing of *command* stops.

When all of the temporary batch files have been created, the first is CALLED, and the main program waits while the temporary files pass control back and forth. When %iterdone% is set, control is passed back up the series of batch files to the main program, which resets all environment variables, deletes the temporary files, and terminates.

Some things worth noting:

- An alternative command line is ITER CLEANUP. Use this to reset ITER's environment variables and delete all of its temporary files (except the *num* directory and file) after a prematurely terminated ITER_RUN.BAT.
- The redirection symbols (<, >, and |) won't work on the ITER command line. If *command* needs to be run with redirection, the command line should be placed

in a batch file, and the batch filename specified as *command* (this is possible because ITER_RUN.BAT CALLs the command).

- Including command line and environment variable notation on the ITER command line will allow *command* to work with the digits of *num* and the environment. The line

```
ITER 5 ECHO %1 OF %_1%
```

will produce these lines on-screen:

Running ECHO 5 times

```
0 of 5.  
1 of 5.  
2 of 5.  
3 of 5.  
4 of 5.  
5 iterations completed.
```

Note: The iterations are numbered 0 to 4.

Allen P. Krygeris
Seattle, Washington



This may well be the ultimate iterating batch file! I've tried similar approaches, but I was stumped by the problem of parsing the input number into its individual digits. The solution in ITER.BAT, using a dummy file and wildcards, is a thing of .BAT beauty! If you want to study its operation, give ITER.BAT a command like

```
ITER 128 ECHO %1%2%3 OF  
%_1%_2%_3%
```

As soon as you start seeing "000 of 128", "001 of 128", and so on, break out of the batch file with Ctrl-Break. Now enter the SET command to see what ITER has put into the environment. You'll see variables of the form _1, _2, _3, containing the individual digits, plus DIGCOUNT containing the number of digits. Examine ITER_RUN.BAT (Figure 2 shows a typical example), and the individual numbered ITER_?.BAT files. After you ex-

ITER.BAT

COMPLETE LISTING

```

@ECHO OFF
IF '%1'=='' GOTO EntryErr
IF '%1'==cleanup GOTO end
IF '%1'==CLEANUP GOTO end
IF '%2'=='' GOTO EntryErr

REM Create file using first parameter

IF EXIST %1\NUL GOTO fail
IF EXIST %1 GOTO fail
MD %1
REN > %1\%1

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%aa SET _1=%aa
SET digcount=1
IF EXIST %1\%_1% GOTO found
IF '%_1'=='' GOTO EntryErr

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%?%aa SET _2=%aa
SET digcount=2
IF EXIST %1\%_1%_2% GOTO found
IF '%_2'=='' GOTO EntryErr

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%???%aa SET _3=%aa
SET digcount=3
IF EXIST %1\%_1%_2%_3% GOTO found
IF '%_3'=='' GOTO EntryErr

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%????%aa SET _4=%aa
SET digcount=4
IF EXIST %1\%_1%_2%_3%_4% GOTO found
IF '%_4'=='' GOTO EntryErr

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%?????%aa SET _5=%aa
SET digcount=5
IF EXIST %1\%_1%_2%_3%_4%_5% GOTO found
IF '%_5'=='' GOTO EntryErr

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%??????%aa SET _6=%aa
SET digcount=6
IF EXIST %1\%_1%_2%_3%_4%_5%_6% GOTO found
IF '%_6'=='' GOTO EntryErr

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%???????%aa SET _7=%aa
SET digcount=7
IF EXIST %1\%_1%_2%_3%_4%_5%_6%_7% GOTO found
IF '%_7'=='' GOTO EntryErr

FOR %aa IN (0 1 2 3 4 5 6 7 8 9) DO IF EXIST %1\%????????%aa SET _8=%aa
SET digcount=8
IF EXIST %1\%_1%_2%_3%_4%_5%_6%_7%_8% GOTO found
IF '%_8'=='' GOTO EntryErr

REM Create and run temporary files

:found
DEL %1\%1
MD %1
ECHO IF NOT '%iterdone%'=='' GOTO end > iter_run.bat
ECHO IF %1%2%3%4%5%6%7%8%9%1% GOTO quit >> iter_run.bat
SHIFT
ECHO CALL %0 %1 %2 %3 %4 %5 %6 %7 %8 %9 >> iter_run.bat

ECHO GOTO end >> iter_run.bat
ECHO :quit >> iter_run.bat
ECHO ECHO %1%2%3%4%5%6%7%8%9% iterations completed. >> iter_run.bat
ECHO SET iterdone=1 >> iter_run.bat
ECHO :end >> iter_run.bat
ECHO Running %0 0 100 200 300 400 500 600 700 80 times.
SET args= |REM space Character at end of set statement prevents error later.
SET iteri=1
SET iterj=2
SET iterdone=
:loop
IF %iteri%==%digcount% GOTO lastpass
ECHO FOR %aaa IN (0 1 2 3 4 5 6 7 8 9) DO IF '%iterdone%'=='' CALL
iter_iterj% target %aaa > iter_iteri.bat
SET args=target %iteri%
SET iteri=%iterj%
IF %iterj%==7 SET iterj=0
IF %iterj%==6 SET iterj=7
IF %iterj%==5 SET iterj=6
IF %iterj%==4 SET iterj=5
IF %iterj%==3 SET iterj=4
IF %iterj%==2 SET iterj=3
GOTO loop
:lastpass
SET iteri=
SET iterj=
ECHO FOR %aaa IN (0 1 2 3 4 5 6 7 8 9) DO IF '%iterdone%'=='' CALL iter_run
target %aaa > iter_%digcount%.BAT
SET args=
CALL iter_1
GOTO end

REM Error code for improper entry by operator

:EntryErr
IF EXIST %1\%1 DEL %1\%1
IF EXIST %1\NUL MD %1
ECHO USAGE: ITER x command arg1 arg2 ... arg9
ECHO where x is a number of less than 9 digits representing the number
ECHO of iterations of the command to run.
GOTO end

REM Error code for first parameter can't be used to create directory

:fail
ECHO Unable to run -- %1 exists as a directory or file. Use a
ECHO different count or run in another directory.

REM Code to clear all variables used and delete temporary files

:end
ECHO Cleaning up...
SET _1=
SET _2=
SET _3=
SET _4=
SET _5=
SET _6=
SET _7=
SET _8=
SET args=
SET digcount=
SET iterdone=
SET iteri=
SET iterj=
IF EXIST iter_*.BAT DEL iter_*.BAT

```



Figure 1: With this batch file, you can repeat a specific command up to 99,999,999 times.

amine the results, run ITER CLEANUP to put things back to normal.

Perhaps you think you'd never need to execute a given command a specific number of hundreds of times? Just the other day, in order to test an error condi-

tion that occurs when the root directory is full, I had to create 224 directory entries quickly. I created the tiny MAKFIL.BAT, containing just this line:

```
REM > A:\%1
```

and called ITER to run it 224 times:

```
ITER 224 MAKFIL %1%2%3
```

That did the job a lot faster than any other method I might have cobbled together!

Because of the way it uses environment variables, ITER.BAT *requires* the CALL command, introduced in DOS 3.3. When you CALL another batch file, that batch file shares the same environment with the one that called it. But when you use COMMAND /C to invoke another

batch file, the secondary batch file has its own separate environment, and any changes to that environment disappear when the batch file ends. ITER_RUN.BAT signals that its task has been completed by setting the variable iterdone to 1. If these batch files used COMMAND /C instead of CALL, they'd never receive that signal.

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ITER_RUN.BAT... COMPLETE LISTING

```

IF NOT '%iterdone%'=='' GOTO end
IF %1%2%3%4%5%6%7%8%9%1% GOTO quit
CALL ECHO %1%2%3 OF %_1%_2%_3%
GOTO end
:quit
ECHO %1%2%3%4%5%6%7%8%
ECHO iterations completed.
SET iterdone=1
:end

```

Figure 2: ITER.BAT (Figure 1) creates a batch file like this one to run whatever command you pass to it.

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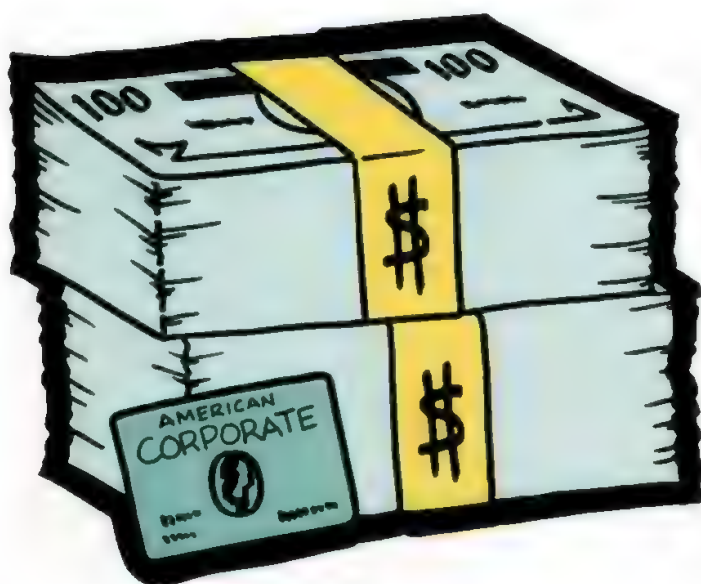


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CIRCLE 055 ON READER SERVICE CARD

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CIRCLE 139 ON READER SERVICE CARD

by
Fran Finnegan

Windows

PROGRAM MANAGER, FSR HOG?

I have been using your WINFSR program (Windows column, November 12, 1991) for a couple of weeks now and have noticed an interesting thing. My Free System Resources (FSR) percentage goes down as I open any Program Group that was not previously opened in Program Manager. It usually amounts to a 1 or 2 percent reduction. But whenever I close the Program Group, the percentage does not go back up! By the end of the day, my FSR percentage can be in the low 40s. Sometimes I restart Windows just to get the percentage to go back up.

Is this something I should be concerned about? Is there anything I can do to keep this from happening and keep my FSR percentage higher?

Stephen R. Holmes
Newtown Square, Pennsylvania

PC Yes, you should be concerned! Program Manager is a real FSR hog in Windows 3.0. The first time you open each group window, it consumes FSRs for the window itself and the icons it contains, and it never frees these FSRs, even when you minimize the group window. You can use my utility, WINFSR to monitor this sort of gluttonous behavior by any Windows application. (WINFSR is available on PC MagNet, in the Utilforum/Tips Forum, Windows section 10.) If you don't use WINFSR, you can check your FSR percentage by remembering to execute Program Manager's or File Manager's Help About command periodically.

The reason Program Manager acts this way, I suspect, is for performance. If you watch closely, or run Windows on a slow machine, you can see that the second time you open a Program Group window, it opens slightly faster. This is because all of the objects within the Program Group window have already been allocated and created, and hence have FSR memory reserved for them.

Is this a reasonable thing for Program

- **PROGRAM MANAGER, FSR HOG?** Why does Program Manager seem to waste your Free System Resources?
- **NO LOGO:** The absolutely, positively easiest way to get rid of the Microsoft Windows start-up logo.
- **SHARE BLOCKING LPT1:** What to do when one of your DOS programs prevents another DOS program from opening LPT1 under Windows.

Manager to do? I don't think so, because the FSRs it consumes are drawn from two 64K segments, both of which are essential. My experience has been that once you get down to about 20 percent of FSRs, you are exposing yourself to some risk. Windows crashes easily when you run out of FSRs. This can happen if you do a lot of multitasking.

There's not much you can do about this problem, other than to organize your Program Groups in an efficient way. Try to put no more than about eight to ten program items in each Program Group; this way your FSR percentage doesn't take too hard of a hit when you open up new groups. Other than this, there is nothing you can do about losing FSRs to Program Manager, except to restart Windows, as Mr. Holmes is doing.

The problem has been addressed to some extent in Windows 3.1. The way the FSR memory is allocated by Windows has been improved, and Program Manager has learned to free up FSRs. But I'm sure you'll find other programs that eat more than their share of FSRs.

NO LOGO

My friends and I have discovered an extremely easy way to eliminate the Microsoft logo at start-up. It doesn't even require using DEBUG at a DOS prompt.

In the Windows SYSTEM directory, there is a file named WIN.CNF. What you have to do is simply erase the WIN.COM file from your main WINDOWS directory. Once this is deleted, you can copy the WIN.CNF file to your main WINDOWS directory. After you have done this, rename the file to WIN.COM. Now when you run Windows, the logo will not appear.

Dean Yorke
Whitby, Ontario

PC Doing this is even easier if you simply copy WIN.CNF from your SYSTEM directory to your main WINDOWS directory, and rename it in the process. For example, if you are in your main WINDOWS directory at a DOS prompt, all you need to enter is

`COPY SYSTEM\WIN.CNF WIN.COM`

Of course, you *could* do all of this easily inside Windows with the File Manager. However you do it, it works under both Windows 3.0 and 3.1.

When you install Windows or change screen drivers, the Setup program merges the WIN.CNF file with the logo files specific to the screen driver you have chosen. For example, if you are running in VGA mode, your WIN.COM file is simply the sum of WIN.CNF + VGALOGO.LGO + VGALOGO.RLE, as constructed by the Setup program. If you are running under another display adapter, you should find other .LGO and .RLE files in your SYSTEM directory. (If you change screen drivers after using the above COPY procedure, you will again have to copy WIN.CNF over the re-created WIN.COM file. This is because a new WIN.COM, for your new screen driver, will have been created by the Windows Setup program.) WIN.CNF

is really the complete .COM program that starts up Windows. The .LGO file is a program that BitBlt (copies) the Microsoft logo (stored in the .RLE file) to the screen. The .LGO portion of the WIN.COM file gets executed *only* if the WIN.CNF portion of the WIN.COM file detects its presence. It does this by checking the first 4 bytes after the end of WIN.CNF for the "LOGO" signature that the .LGO files begin with.

This method of eliminating the logo also speeds up the loading of Windows. Not only does the new WIN.COM not have to paint the logo, but it will load faster from disk, since it is shorter without the .LGO and .RLE components. And because it doesn't contain those parts, it also saves you some disk space.

SHARE BLOCKING LPT1

If you run DOS shells and programs from within the Windows environment, essentially using Windows as a task switcher, and you're running SHARE (as you're supposed to do), there's a potential problem you should be aware of: Your LPT1 default printer port may be tied up by a less-sophisticated application.

Because multiple DOS and Windows applications may try to access the same file concurrently, DOS provides SHARE.EXE to add some degree of file protection to your system. Windows users should either install SHARE from within their CONFIG.SYS file or run it in their AUTOEXEC.BAT file (depending on their version of DOS).

SHARE monitors all program requests to create, open, write, read, rename, or delete files. Its purpose in life is to prevent conflicting file access requests, which may occur in multitasking environments such as Windows. SHARE's job is especially complicated because it has to protect, to the limited extent that it can, files even for programs that are not SHARE-aware. For programs that *are* SHARE-aware, it provides advanced services. SHARE allows applications to explicitly block or not block other programs from accessing specific files, provided the applications are coded to use certain file-sharing features of SHARE.

The problem occurs when you have a DOS program that doesn't recognize task switching (and, hence, is not coded to use the advanced features of SHARE). Unfortunately, most DOS programs probably fall into this category. Moreover, most DOS programs probably do not use

SHARE's special file-sharing features.

If an application opens a file, but the application is *not* SHARE-aware, SHARE will block a second program that is written for the presence of SHARE from subsequently opening the file. This is the safe thing for SHARE to do.

Usually this is not a problem, because you know which programs you're running and which files are being accessed by those programs. However, if you are not aware of a file being opened and kept open by a program—especially when the "file" is a device such as LPT1, which DOS interprets as your default parallel port printer—it could be a real problem. Not all programs open the LPT1 "file" in order to print, so SHARE will not always be involved; some bypass DOS and write directly to the printer port. Windows has its own printer device driver built-in for Windows applications; it does not deal with LPT1 as a "file," so SHARE is bypassed when Windows applications write to LPT1.

It's okay (and necessary) for a program to keep the LPT1 "file" open during the time it is printing. For example, use the DOS COPY command from one Windows DOS shell to copy a file to LPT1. While it's printing, try to copy a different file in a different Windows DOS shell to LPT1. (If it's a small file, you'll have to be quick.) You should get a "Sharing violation . . ." message in the second DOS shell, because the LPT1 "file" (really your printer) is being used by the first one and is being protected by SHARE. As soon as the first DOS shell is finished, your second one can successfully print. DOS only keeps LPT1 open during the actual printing process.

Unfortunately, some less-sophisticated DOS programs open LPT1 when they're first executed and don't close LPT1 until they're terminated, even if you never request a print operation. One program I use that's like this is *TAPCIS*, a shareware program that makes using CompuServe and PC MagNet easier. *TAPCIS* is oblivious to task switching and SHARE, as are all programs written in Borland's Turbo Pascal that use its PRINTER unit.

While *TAPCIS* is running in a DOS shell, even if it is doing nothing, you cannot copy a file to LPT1 from another DOS shell. In fact, any DOS program coded with awareness of SHARE (as DOS itself is) will not be able to open LPT1 for

printing, because it will be blocked automatically by SHARE. Windows programs printing to the "file" LPT1.OS2 will experience the same problem, since printing this way bypasses Windows' built-in device drivers and is handled by DOS and SHARE.

Is it possible to bypass this erroneous block that *TAPCIS* (or any other selfish program) has caused SHARE to place on LPT1, since presumably you know when you're printing with the program and when you're not?

It is—by recognizing that DOS treats the PRN "file" as a pseudonym for LPT1. If you want to copy a file to the printer from within a different DOS shell, all you have to do is copy it to the PRN "file," or have your DOS program do so. For example, at the DOS command line under Windows, enter

```
COPY filename.ext PRN
```

SHARE will not intervene to block this operation, because it considers LPT1 a different file than PRN. DOS will therefore see the print request and carry it out.

If you're having a similar problem with a Windows application that is writing to the "file" LPT1.OS2 (which you will find in the [ports] section of your WIN.INI file), you could change the LPT1.OS2 in WIN.INI to PRN.OS2 or, in step with the times, PRN.WIN. LPT1.OS2 and LPT2.OS2 are in your WIN.INI file in order to support Windows running in OS/2's compatibility box. They are simply filenames that represent the LPT1 and LPT2 printer ports, which Windows drivers could not talk to under OS/2; the .OS2 extension has no meaning, except to indicate that these filenames are in WIN.INI because of OS/2. By writing to these "files," you bypass the Windows printer port drivers and are writing directly to DOS or OS/2.

OPENING WINDOWS

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by
M. David Stone

The Working Word

NONPRINTING WINWORD GRAPHICS

Here's an interesting and highly frustrating quirk in *Microsoft Word for Windows*: If you use the Color choice on the Windows Control Panel to set up Windows with a blue window background and white window text, and then try importing a .PIC file (created in *Quattro Pro*), all will appear to go well, until you try to print. The image will show properly on-screen in both normal and page views. But, at least with a LaserJet III printer driver, you will not be able to print the .PIC file or see it in print preview mode. One solution is to return to Windows' default colors. If you do this, the imported .PIC image will print without problems.

Mark Soonpaa
Grand Forks, North Dakota



An interesting quirk indeed, although anyone who has run into this would probably argue that the key phrase is "highly frustrating." The problem is not specific to either the LaserJet III driver or to white text on a blue background, though it does seem to be specific to Lotus-format .PIC files. It showed up in *Word for Windows 1.1a* with every *Lotus 1-2-3* .PIC file I tried it with, but not with .TIF or .BMP files. It also showed up with various background colors, and with an assortment of printer drivers, including drivers for PostScript printers and dot matrix printers. Note, however, that *Word for Windows 2.0* seems to have solved this problem—another good reason to upgrade.

But even if you haven't upgraded to Version 2.0 yet, you don't need to give up custom colors entirely. Experimenting with different background colors pinned the problem down to the text color setting. As long as Windows is defined for white window text, *Word for Windows 1.1a* won't print the graphic or show it on the print preview screen. As soon as you redefine the window text to some other color, the graphic will show

- **NONPRINTING WINWORD GRAPHICS:** Why your .PIC files may not print if you've changed Windows' default colors.
- **HIDE YOUR WINWORD DOCUMENT:** These brief *Microsoft Word for Windows* macros quickly cover up the document you're working on and require a password to redisplay it.

in print preview mode and on the printed page.

Be aware that the printed results for different text colors vary somewhat, depending on the driver. The rule of thumb is, the darker the window text color, the better the output. Black text guarantees the best result. But if you don't like black text, you should try different text colors to see whether they make a difference on your printer.

HIDE YOUR WINWORD DOCUMENT

Word for Windows does not offer a screen-blanking and lock-out feature to keep others from looking at a sensitive document when you leave your desk for a moment. Figure 1 shows a macro that will let you hide a document from view, and then put it back on-screen when you return.

In order to create the macro, go to the macro editing screen by choosing Macro Edit, entering an appropriate name, and choosing OK. (In Version 2.0, choose Tools Macro, enter the name, and then choose Edit.) Type in the macro (shown in Figure 1), substituting your actual password in quotation marks for the "pass-

word" on line 7. When you've finished typing the macro, choose File Close.

When you run the macro, it will first show you a message box telling you that the correct password must be entered to continue. Choose OK, and the macro will reduce *WinWord* to icon form, with the AppMinimize command. To reopen the program, you have to select the icon and type in the password. When you do, *WinWord* will expand to full screen (using the AppMaximize command).

The first If statement in Figure 1 tests any typed entries to see whether they match the password. If they don't, the macro will beep, increment the value of the variable pw by 1, and return to the Repeat label to wait for more input. If the entry does match the password, the macro will go to the Done label and the second If statement.

This second If statement tests to see whether there have been any incorrect password entries. If there have, it shows a message box stating how many. You can then choose OK to return to your document. If there haven't been any incorrect password attempts, the macro expands the *WinWord* document to full screen without delay.

For greatest convenience, you'll probably want to assign the macro to a key, using the Macro Assign to Key dialog box (Tools Options Keyboard in Version 2.0). If you use Ctrl-Shift-P, for example, then, when a snooper comes into your office, you can blank the screen quickly by typing Ctrl-Shift-P, Enter.

Jonathan Lewin
Wellesley Hills, Massachusetts



This can be a useful, though mild, security measure, as long as you realize that the emphasis is on the word *mild*. Among the original version's limitations is that you can abort it at any time by hitting Esc. To prevent that, add the command

DisableInput 1

PASSWORD MACRO FOR WINWORD

```
Sub MAIN
MsgBox "Correct password must be entered to continue", \
"Password Locked"
AppMinimize
Repeat:
Input "Enter password", a$
If a$ = "password" Then
Goto done
Else
Beep
pw = pw + 1
End If
Goto repeat
done:
If pw > 0 Then
MsgBox "Incorrect password entered" \
+ Str$(pw) + " times", "Password Unlocked"
End If
AppMaximize
End Sub
```



Figure 1: This password macro hides a *Word for Windows* file by minimizing *Word* to its icon and preventing further editing or scrolling of text until you enter the correct password.

IMPROVED PASSWORD MACRO FOR WINWORD

```
Sub MAIN
FileNew
If Not DocMaximize() Then DocMaximize
repeat:
On Error Goto 0
On Error Goto Repeat
DisableInput 1
a$ = InputBox$("Enter Password ", " Password Locked ")
If a$ = "password" Then
Goto done
Else
Beep
pw = pw + 1
End If
Goto repeat
done:
If pw > 0 Then
MsgBox "Incorrect password entered" \
+ Str$(pw) + " times", "Password Unlocked"
End If
FileClose
End Sub
```



Figure 2: An enhanced version of the macro in Figure 1. This version hides the current document by opening a new empty file rather than minimizing *WinWord*.

before the label Repeat. Although it's not obvious from the statement's name, DisableInput 1 will tell the macro to disable the Esc key's ability to interrupt the macro.

Another limitation is that you can go back to a full-screen view of *WinWord* at any time simply by using Ctrl-Esc to bring up the Windows Task List, then choosing *WinWord*. (In fact, with *Word for Windows*, Version 2.0, you must go back to *WinWord* this way to enter the password. If you try typing the password with the Program Manager and *WinWord* 2.0 icon showing, the keystrokes will go

to the Program Manager, not to *WinWord*.) You won't be able to make any changes in the document or scroll through it, but you will be able to see whatever was on-screen when you started the macro.

One way to avoid this second problem is to replace the AppMinimize and AppMaximize commands with FileNew and FileClose, respectively. As long as you haven't already opened *WinWord*'s maximum of nine windows, this will open a new window at the start of the macro and close it at the end.

To ensure that the new, blank docu-

ment covers the entire *WinWord* window, use the function DocMaximize() to see whether the window is maximized, and the command DocMaximize to maximize the window if it isn't already. The statement takes the form

```
If Not DocMaximize() Then
DocMaximize
```

Two finishing touches: Delete the first message box; this way the document is covered as soon as you invoke the macro, without the need for another keystroke. And last, replace the Input line, which prompts you in the status line at the bottom of the window, with the more prominent InputBox\$, as follows:

```
a$=InputBox$ ("Enter password",
"Password Locked")
```

This displays a large dialog box anchored in the center of the window, with the title "Password Locked" in the title bar, and the message "Enter password" above a text box.

Note that if you use InputBox\$, you'll also have to add an On Error Goto 0 and an On Error Goto Repeat statement. On Error Goto 0 resets the error condition on each loop. Without it, the macro will abort if someone chooses Cancel twice. On Error Goto Repeat tells the macro to go back to the Repeat label, rather than abort with an error message when someone chooses Cancel in the dialog box.

Figure 2 shows the improved macro. Note, however, that it's still not foolproof. To beat its password lockout, the snooper would have to reboot your system or open another program to look at the file. Note, however, that *Word for Windows*, Version 2.0 (but not Version 1.0) has a password protection feature for opening its data files. So with Version 2.0, you can use this macro to hide the file on-screen, and the built-in feature to prevent anyone from opening the file after rebooting your system.

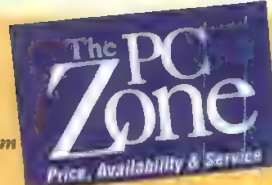
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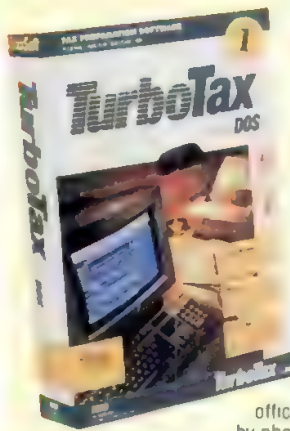
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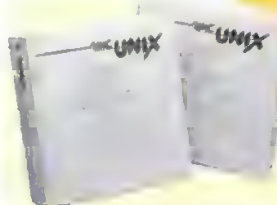
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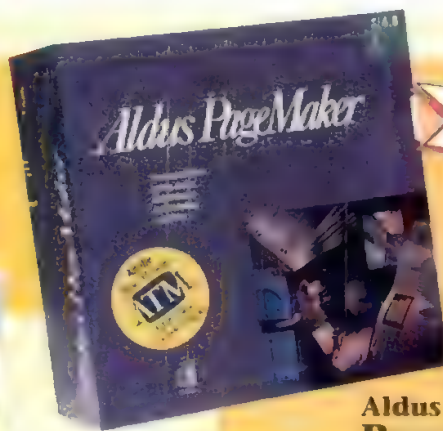
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by
Craig Stinson

Spreadsheets

NONIDENTICAL X VALUES

Quattro Pro's x,y graphs let you plot up to six data series (series A through series F), but each series has to be plotted against the same set of x-axis values. This limitation generally presents no problem for business charting, where the items to be graphed are such things as profit, loss, and expenses, and the x values represent dates along a common time axis.

The information I need to chart as an engineer isn't always so neatly ordered. Sometimes I need to plot multiple sets of x,y coordinates. I might want series A to be plotted against one set of x-axis values and series B to be plotted against a second set. Even though all the x values may fall within a common range, I may not have exactly the same x values for series A as for series B. In some instances, there may not even be the same number of coordinate pairs for each series.

Figure 1 is an example of this. This table contains data collected on two machines and shows the output level and the power required for that output, as the

■ **NONIDENTICAL X VALUES:** You can use more than one set of x coordinates on the same x,y chart.

input is varied in fixed steps. Data for the second device was taken at fewer input levels, because the output changed less rapidly than that of the first device. But I wanted to plot power versus output for both machines and show the two curves on the same x,y graph. The *Quattro Pro* manuals did not help me solve this problem, but I did find a method that works quite nicely.

The first step was to "stack" one set of data on top of the other, as shown in Figure 2. This allowed all the data to be plotted, but only as a single y series. When I plotted the data this way, I lost the ability to use the /Graph|Customize Se-

ries menu options to differentiate between the data for each machine. I also got a strange line connecting the two data sets, as shown in Figure 3.

Two further actions were needed to set things right. First, I offset the A-series and B-series data into separate columns, while maintaining the row relationship with the unified x-axis column—as shown in Figure 4. Second, I designated the entire length of the y-axis columns, not just the parts containing actual data, as my A and

GRAPH DATA 1					
Data Set 1			Data Set 2		
Input	Output	Power	Input	Output	Power
5	91.1	472	5	90.2	312
10	96.9	522	10	96.1	336
15	100.2	596	15	99.5	374
20	102.8	706	20	102.3	434
25	104.9	855	25	104.3	509
30	106.6	1036	30	106.0	599
35	107.9	1252	35	107.4	711
40	109.1	1491	40	108.5	831
45	110.1	1792	45	109.6	982
50	111.1	2132	50	110.6	1153
60	112.7	2958	60	112.3	1583
70	114.1	4046	70	113.8	2153
80	115.1	5490	80	114.6	2684
90	115.5	6350	90	115.1	3022
100	115.7	6935	100	115.3	3261
110	115.9	7445	120	115.7	3607
120	116.0	7806	160	116.1	4026
140	116.3	8372	200	116.3	4262
160	116.5	8776			
180	116.6	9069			
200	116.7	9290			

Figure 1: Two groups of data that contain a different number of x values, yet need to be plotted on the same chart.

GRAPH DATA 2		
	A Output	B Power
1		
2		
3	91.1	472
4	96.9	522
5	100.2	596
6	102.8	706
7	104.9	855
8	106.6	1036
9	107.9	1252
10	109.1	1491
11	110.1	1792
12	111.1	2132
13	112.7	2958
14	114.1	4046
15	115.1	5490
16	115.5	6350
17	115.7	6935
18	115.9	7445
19	116.0	7806
20	116.3	8372
21	116.5	8776
22	116.6	9069
23	116.7	9290
24	90.2	312
25	96.1	336
26	99.5	374
27	102.3	434
28	104.3	509
29	106.0	599
30	107.4	711
31	108.5	831
32	109.6	982
33	110.6	1153
34	112.3	1583
35	113.8	2153
36	114.6	2684
37	115.1	3022
38	115.3	3261
39	115.7	3607
40	116.1	4026
41	116.3	4262

Figure 2: This arrangement of the data produces the graph in Figure 3.

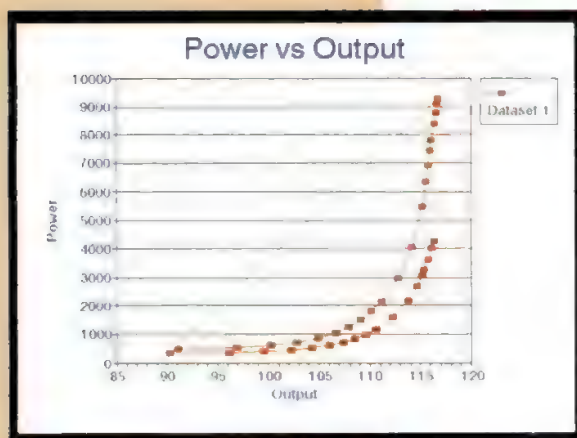


Figure 3: This graph was produced by the data in Figure 2. Note the unwanted "bowstring."

B series. In other words, I specified B4..B42 (not B4..B24) as my A series and C4..C42 (not C25..C42) as my B series. The result is shown in Figure 5.

David C. Swanson
Franklin Park, Illinois



The technique described by Mr. Swanson can be used in all versions of *Quattro Pro*, *Lotus 1-2-3*, and *Micro-*

soft Excel. A few basic principles will help you understand how it works.

The first principle is that if you ask for a connected x,y graph, as opposed to a scattergram, your program will plot your x-axis values in the order in which they appear in your worksheet. If these values

are not sorted, your plot lines will loop back on themselves at least once. That's what's happening in Figure 3. The chart follows a normal-looking curve until it gets to the coordinate pair (116.7,9290). Then, the next coordinate pair to be plotted is (90.2,312), so the chart loops back, producing the odd-looking straight line mentioned by Mr. Swanson. Note that the entire chart in Figure 3 is a single line. It curves upward to (116.7,9290), dives back to (90.2,312), then curves upward again to end at (116.3,4262).

The second principle is that blank cells in any of your data ranges—the x-axis range or any of the y-axis ranges—are treated as discontinuities in the x,y plot. The program skips over them and goes on plotting. Thus, one way to eliminate the unwanted bowstring in Figure 3 would be to insert a blank row beneath the coordinate pair (116.7,9290). The result would appear to be two lines, because of the discontinuity between (116.7,9290) and (90.2,312). Unfortunately, the program would still treat the whole thing as a single data series, foiling any attempt to

distinguish the two lines with point markers, a legend, or different colors.

Note, by the way, that blank cells in data ranges have a very different effect from zero values. In many spreadsheet situations, a blank is as good as a zero and vice versa. In an x,y plot, zero values put points on the x or y axis, while blanks produce discontinuities.

The third principle is that any of your y-axis series (series A through F) can have fewer points than your x-axis series. But no matter how the data is aligned on your worksheet, the program will always pair the first y-axis point with the first x-axis point, the second y with the second x, and so on until it runs out of y values. This is why Mr. Swanson had to designate the entire ranges B4..B42 and C4..C42 as his A and B series. Making the A and B series B4..B24 and C25..C42 would have produced a perplexing chart, in which Power 1 would be plotted against x values rang-

GRAPH DATA 3

	A	B	C
1	Output	Power 1	Power 2
2			
3	91.1	472	
4	96.9	522	
5	100.2	596	
6	102.8	706	
7	104.9	855	
8	106.6	1036	
9	107.9	1252	
10	109.1	1491	
11	110.1	1792	
12	111.1	2132	
13	112.7	2958	
14	114.1	4046	
15	115.1	5490	
16	115.5	6350	
17	115.7	6935	
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27	102.3		434
28	104.3		509
29	106.0		599
30	107.4		711
31	108.5		831
32	109.6		982
33	110.6		1153
34	112.3		1583
35	113.1		2153
36	114.6		2684
37	115.1		3022
38	115.3		3261
39	115.7		3607
40	116.1		4026
41	116.3		4262

Figure 4: The final correct arrangement of the data, which produces the graph shown in Figure 5.

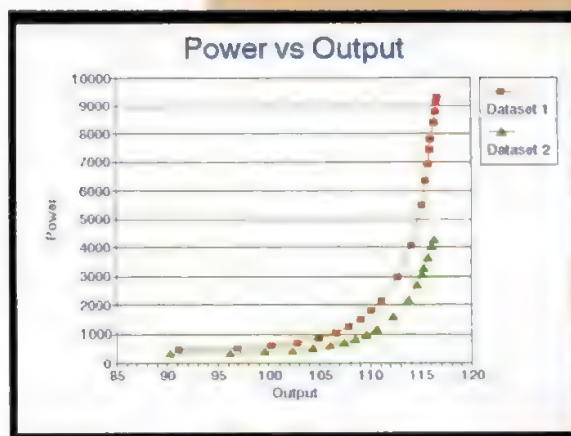


Figure 5: This chart shows that series with different x coordinates can be plotted on the same graph.

ing from 91.1 to 116.7, while Power 2 would be plotted against the first 18 of those same x values!

HINTS, TIPS, QUESTIONS

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by
Frank J. Derfler, Jr.

Connectivity

NETWARE LITE AND ODI

I've read that Novell uses something called ODI drivers in *NetWare Lite*, its peer-to-peer LAN operating system. What does that mean? Is *Lite* incompatible with other versions of *NetWare*?

James Murphy
Lakeland, Florida



Novell's Open Datalink Interface (ODI) drivers first shipped in late 1990 as part of *NetWare*, Version 3.11. The company introduced ODI for several reasons, including the need to

- erect a defense against Microsoft's popular Network Driver Interface Specification (NDIS);
- make it easier for LAN-adapter manufacturers to keep up with changes in *NetWare*;
- allow people to load multiple protocol stacks at the same time;
- provide an architecture closer to the layers of the OSI model.

Under the ODI architecture, the LAN-adapter manufacturer supplies a small piece of software usually carrying the card's name—3C507, for example. One part of the program contains code customized for communication with that specific model and version of adapter, but the other works with a standardized piece of Novell software called the Link Support Layer (LSL). Another standard routine, IPXODI.COM, runs over the LSL, responding to IPX calls used by both the *NetWare* shell and a few special applications such as 3270 SNA terminal emulators. Finally, the *NetWare Lite* redirector or NETX.COM (or both) run over IPXODI.COM.

This architecture saves vendors from worrying about changes made to the IPX installation program and frees *NetWare* installers from linking and compiling customized versions of IPX.COM for every adapter. Novell couldn't push its ODI, though, until hardware companies delivered the programs to go between the adapters and LSL. *NetWare Lite* serves as

■ **NETWARE LITE AND ODI:** Novell's ODI architecture lets you run multiple protocols simultaneously.

■ **BANISHING MICRO CHANNEL FEAR:** Network administrators often realize the need for servers with advanced bus designs, but hesitate to enter uncharted waters. Here's a real lifesaver for those considering a Micro Channel plunge.

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both carrot and stick to spur the development of ODI drivers.

To specifically answer your question, you can give a client PC on a network simultaneous access to *NetWare 2.xx* and *3.xx* servers and to *NetWare Lite* servers by loading both the *Lite* redirector and the NETX.COM *NetWare* shell. You must, however, configure and manage the redirection of each client to each server, using separate tools for *Lite* and the older versions of *NetWare*.

Novell representatives hint about a *NetWare* Loadable Module that will tightly integrate *NetWare 3.xx* with *Lite*, but they mention no delivery date. Frankly, Artisoft and WebCorp offer integration equal to Novell's between their peer-to-peer LANs and the dedicated *NetWare* products. In fact, WebCorp recently dem-

onstrated improvements to its network operating system, giving it far better interoperability with *NetWare 2.xx* and *3.xx* than *NetWare Lite*. Technologically, Novell would have been better off licensing WebCorp instead of releasing *Lite*.

Still, *Lite* is valuable as training wheels for ODI. The ability to run multiple protocols simultaneously under the ODI architecture is important to Novell's grand *NetWare* strategy. You can load the IPXODI.COM interface and, for example, an IPODI.COM interface at the same time, thereby mapping drives through the NETX.COM program to *NetWare* servers and to IP-based networks through the same LAN adapter. Mongrel networks built from many types of computers, operating systems, and communications protocols are a fact of modern life. The capacity to load multiple protocol stacks gives relatively unsophisticated users easy access to a variety of resources on these diverse networks.

Novell's recently announced Hub Management Interface (HMI) is an example of the strategic uses of the ODI architecture. HMI allows companies to integrate their wiring hubs into Novell servers instead of installing separate wall- or rack-mounted wiring devices with their own power supplies. Hub-card vendors, including David Systems, Exos, Intel, Proteon, Standard Microsystems, SynOptics Communications, 3Com, and Ungermann-Bass, have to provide only a small piece of software to integrate their products into the server under the LSL layer. The companies can add a higher level interface for hub management—even over IP for compatibility with the TCP/IP Simple Network Management Protocol (SNMP). Developing software for the lower-level interface is so easy, though, that many companies are on the HMI bandwagon.

By the way, while I think putting the wiring hub in the server is an interesting idea that many organizations will use, remember that it probably means you will

have to put your server in the wiring closet. Depending on the environmental, power, and security controls there, that may or may not be a good idea. Internal wiring hubs are nice, but for anything more than a dozen nodes, Digital Equipment Corp.'s modular DEChub still wins my vote for the right way to design a 10BaseT wiring center.

If you're interested in *NetWare Lite*, you should also know that Xircom is bundling its external LAN adapters with the Novell offering in a product Xircom calls *Network Simplicity*. The complete package includes an automated installation program and even a pop-up e-mail application. Xircom (818-878-7600) sells a two-node starter kit for \$849.

BANISHING MICRO CHANNEL FEAR

The ISA (Industry Standard Architecture) computer data bus becomes the performance bottleneck in modern file and print servers. Many network administrators, aware of the problem, know they should use MCA (Micro Channel architecture) or EISA (Extended Industry

One advantage of unshielded twisted-pair wiring is its "home run" architecture, which reduces the network's vulnerability to a total outage from a single bad connector.

Standard Architecture) bus machines but feel intimidated by a lack of experience with the systems. Here's a new source of help for anyone who is considering MCA equipment.

Dr. Pat Bowlds of IBM has put together a book called *Micro Channel Architecture* published by Van Nostrand Reinhold. Anyone puzzled over the value of bus-mastering MCA LAN adapters will appreciate her description of bus master-

ing and comparisons between MCA, ISA, and EISA. The book sells for \$34.95. If you call 800-926-2665 they'll send it on approval for 15 days. Dr. Bowlds holds a Ph.D. in this area and heads a group that develops servers and other interesting products for IBM. She knows what she writes about!

TESTING UNSHIELDED TWISTED-PAIR CABLES

The trend toward using unshielded twisted-pair wire for both Token-Ring and Ethernet cabling has reached a full gallop. IBM announced that it will market Token-Ring adapters with on-board connectors for unshielded twisted-pair wiring rather than forcing you to use the so-called "media filter" to convert between the adapter board's shielded twisted-pair connector and unshielded twisted-pair cable. The popularity of wiring concentrators for 10BaseT Ethernet-over-twisted-pair wiring systems is skyrocketing.

The unshielded twisted-pair wiring scheme has two advantages. First, its "home run" wiring architecture—a single cable run from each node to the concentrator—reduces the network's vulnerability to a total outage from a single bad connector. Second, it's likely that the wire already installed in your office for a PBX telephone system can also carry your LAN data.

Unshielded twisted-pair wiring isn't all alike, though. Even when professionally installed just for LAN use, it requires special testing and care. I'm really impressed by the information you get from

the Next Scanner marketed by Microtest. You can hold this little device in one hand, yet it can generate a database of your wiring system and create sophisticated reports through a PC link. The system will tell you immediately, for example, if the wiring you're using for 4-megabit-per-second Token-Ring will support an upgrade to 16-Mbps devices.

Figure 1 shows one screen of a report created by the Next Scanner. The device measures the amounts of loss and noise in the cable within specific frequency ranges and recommends usable pair combinations. The program's display uses asterisks to flag individual test failures on each wire pair. In our example, the display shows a poor cable system with excessive cable lengths and loss.

The Next Scanner tests coaxial and shielded twisted-pair wiring too, but I think its greatest value will be for those wanting to use unshielded twisted-pair wiring. Contact Microtest at 602-971-6464 for more information.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay you \$50 for any tip we print. Please submit your letter on-disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016. You may also contact Frank J. Derfler, Jr. via MCI Mail (MCI ID: 240-2931) or the LAN Labs fax machine (904-837-0737). We regret that we're unable to acknowledge submissions or answer letters individually. ■



Figure 1: This shows one screen of a report created by the Next Scanner, a device that measures the amounts of loss and noise in a cable within specific frequency ranges.

by
Stuart Greenberg

PC MagNet

NEW BENCHMARK TESTS

PC Magazine Labs has recently published Release 6.0 of the Hardware Performance Tests. It's a standard suite of tests used by PC Labs to analyze the performance and suitability to task of the hardware products we review. We first began distributing the benchmark tests on-disk in 1985 so you, too, could test the equipment you use, buy, or sell.

You can get a copy of the benchmark tests by downloading BEN60.EXE, a self-extracting archive, from PC MagNet, Library 16 in the Utilforum Tips Forum, or from SOFTLIB. Once you've unarchived all the files, type BENCH at the DOS prompt to run the benchmark tests.

Release 6.0 has three test categories: Performance, Compatibility, and Quality. The Performance category includes tests for Processor (including instruction mix, 128K NOP Loop, Do Nothing Loop, Integer Add and Multiply, String Sort and Move, Prime Number Sieve, Floating-Point Mix, and Math Coprocessor), Memory (Conventional, Expanded, and Extended Read/Write), Disk Access, DOS File Access, Variable Size Records, EGA/VGA Text, EGA/VGA Graphics, Print Speed, Battery Rundown, and Timer. The Compatibility category includes pass-fail tests for VGA, and the Quality category includes a test for EGA/VGA displays.

If you're familiar with the benchmark test series, you'll recognize a fair number of these tests. However, in this release, the method of reporting results has changed. Previously, the tests reported the amount of time it took to do a fixed amount of work. For example, the 128K NOP test was run 87,040 times, and the time it took to complete the test was the number that we reported. While this is a reasonable method of testing, it did not allow for increases in processing speeds. As machines got faster, the numbers got smaller until they threatened to become too small to measure accurately.

Most tests in Release 6.0 are run for a fixed time period (10 seconds), and the



amount of work done per second is reported. If one iteration of the test exceeds 10 seconds, the actual duration is used to compute the number of operations per second. Faster machines now yield higher numbers, leaving plenty of headroom for the future. The one exception to this methodology is the disk tests: These are run once, and the throughput numbers are computed from the elapsed times.

One of the things you'll immediately notice when you run Release 6.0 is its new interface. Using the Zinc Interface Library for C++, this version sports drop-down menus and windows; it automatically determines your display adapter and mode, and has support for VGA and EGA graphics, a mouse, and graphs.

You'll also notice a database of our testing results for a number of machines. As you perform your own tests, you can add your data to this. It was written using Codebase ++ and is in the standard dBASE IV format (.DBF and .MDX).

The database tracks tests and results by machine. When you run BENCH.EXE, the Machine Information screen will pop up. Enter a unique code number as the machine ID. You will then be prompted to enter a parameter from 1 to 9, called a *variant*, to differentiate among configurations of the same machine. For example, a variant of 1 may be used for a machine with the disk cache enabled and a variant of 2 used for the same machine with disk cache disabled.

Each test has a record in the database entered according to a particular formula. For example, the 128K NOP Loop test is identified as PCMAG PROCSR005. PCMAG is the creator of the test, PROCSR is an abbreviation for the test

group, Processor, and 005 is a number assigned to each test sequentially as it is entered in the database. Each test result is also placed in a record identified by a combination of the machine ID, variant, test ID, and the time the test was run.

In past releases, comparison of test results was limited to a predetermined set of machines versus the current machine under test. Now you can make comparisons between different machines as well as different runs using the same machine, and you can select any previously stored results for comparison.

The layout of the database files and an example of how to work with them are in the file BEN6DB.EXE on PC MagNet.

What is not immediately evident in Release 6.0 is its new, modular design. The user interface and database engine are in one executable, BENCH.EXE; each test group is in its own executable file, which is accessed by BENCH.EXE as an overlay.

Once a test has been entered in the database, it will be available on the menu. When you access the test, BENCH.EXE loads it into memory and communicates with it by sending and receiving messages. For example, BENCH.EXE may tell PROCSR.EXE to run a particular test. Upon receiving this message, PROCSR.EXE begins execution of the test and eventually sends a message back to BENCH.EXE containing the result.

This modular approach avoids duplicating the user interface code in each of the group programs. It also lets us update and add tests without necessarily changing BENCH.EXE. Similarly, since the messages simply make requests without dictating how the request should be executed, BENCH.EXE itself can be changed without affecting the execution of the test groups.

The changes we've incorporated into Release 6.0 will help us keep pace with fast-changing technology and help you have the data you need to make intelligent purchasing decisions. ■

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by
Richard Hale Shaw

Utilities

Not long ago, I was searching my hard disk for a C++ source code file. I couldn't remember where I'd put it, so I scanned the hard disk using my favorite file-finding utility. I turned away for a moment, and when I looked up, my file-finder had turned up a half-dozen copies of the .CPP file I'd been looking for. When I ran the file-finder with C:*, I found that over 1,000 of the 7,000 files on my machine were duplicates—occupying 40MB of the 200MB of disk space.

It's easy enough to find duplicates, but it's not so easy to delete them. First, you need to create a listing that includes the date, time stamp, and size of each copy of the file. Michael Mefford's REPEATS.COM (Utilities, June 9, 1987) can print a duplicate file listing to the screen or the printer, but it operates on only one drive at a time. So you need to generate a listing for each drive and then merge them somehow. Once you have such a list in hand, you'll have to begin comparing date, time, and size information for each set of duplicates and then mark files for deletion.

However, you may need more information than date, time, and size to determine whether to delete certain files. In such cases, you will have to use another utility to view the files, maybe even a third if you want to do a byte-for-byte comparison. If you have many duplicate files, you may not be able to delete them all in one sitting. In this case, you'll have to save the file or paper list of duplicates, which will probably be out of date by the time you return to it!

SHOWDUPE can spare you this tedious and time-consuming process. Compatible with DOS 3.0 and later, SHOWDUPE will find all duplicate files on one or more hard disk drives, organize them, display them in a list box, and let you interactively view, compare, select, and delete them.

The easiest way to get a copy of SHOWDUPE.EXE is to download it from PC MagNet (see the sidebar "Download-

Rid Your Disk of Duplicate Files with SHOWDUPE.EXE

■ Are duplicate files cluttering your directories and taking precious disk space? SHOWDUPE can find them and make deleting them a breeze.

ing Utilities"). The C++ source code is also available from PC MagNet. To recompile it, you will need Borland C++ 2.0 or 3.0, or the Microsoft C++ 7.0 Compiler. If you don't have a modem, you can get a copy of the source code by mail or fax. Send a postcard with your name and address (or fax number if applicable) to the attention of Katherine West, Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; no phone calls, please.

USING SHOWDUPE

The syntax for SHOWDUPE is

```
SHOWDUPE <d:\path> [d:\path]
```

where *d* is the drive and *\path* is the path to the directory in which SHOWDUPE should begin to search. SHOWDUPE will recursively search each directory and all of its subdirectories. If you don't specify at least a drive on the command line, SHOWDUPE will default to the Search Directories entry in SHOWDUPE.INI, its configuration file (see the sidebar "Customizing SHOWDUPE").

As the syntax indicates, you can spec-

ify more than one search drive and path on the command line. For example

```
SHOWDUPE c:\ d:\olddos
```

There's no limit to the number of drives or directories you can specify on the command line. The total number of files SHOWDUPE can scan is limited only by the amount of conventional memory you have available; I've used it to scan over 7,000 files on a 200MB hard drive without any problems.

Before you run SHOWDUPE, make sure SHOWDUPE.EXE and SHOWDUPE.INI are both in the current directory, or in a directory that is on your path. Once you execute the program, SHOWDUPE displays a window that lists all files in the designated directories as it scans them. It then displays a window that lists your duplicate files, as shown in Figure 1.

After it has found all of the duplicate files, SHOWDUPE builds two tables, DUPES.IDX and DUPES.DAT, which it puts in the same directory as SHOWDUPE.EXE and SHOWDUPE.INI. Once it has created these files, the program won't attempt to create them again unless you delete them.

DUPES.IDX contains a sorted list of the filenames; DUPES.DAT contains date, time, size, and directory pathname information. All this information could have been stored in a single file, but then when the filenames were sorted, SHOWDUPE would have to load all this information into memory when, in fact, it only needs the filenames.

The menu bar at the bottom of the

CUSTOMIZING SHOWDUPE

by Richard Hale Shaw

With the increasing popularity of Microsoft Windows, it seems like almost every tips column in every magazine describes changes you can make to your WIN.INI file. Initialization files are useful to DOS programs, too: You might have noticed that a number of applications, including the Norton products, use .INI files to store program settings.

Initialization files are incredibly convenient, because you don't have to patch the program or own the source code to change the application. But they can be difficult to use. Some .INI files, like that of *The Norton Commander*, are largely binary; others, like Windows' WIN.INI, are not much more comprehensible. After all, who can remember what color setting 113 represents?

I wanted to ensure that SHOWDUPE's initialization file, SHOWDUPE.INI shown in Figure A, would be easy to configure and understand. You can edit SHOWDUPE.INI with a simple text editor; you can use plain English words to indicate settings (for example, the word BLUE designates that color). SHOWDUPE.INI can contain settings and values in upper- or lower-case letters, or both. As with most .INI files, you can comment out a line by placing a semicolon (;) in front of it and add comments to a line by prefacing the comment with a semicolon. Whenever the program encounters a semicolon, it ignores that character and the rest of the line. Note that if a line is repeated, the second occurrence will take effect. For example, if you have ScreenBackGround=BLUE and then ScreenBackGround=RED, the background will be red.

SHOWDUPE.INI lets you configure SHOWDUPE's screen colors, desktop colors, and window colors. You can also specify whether the program runs in 43- or 50-line mode on an EGA or VGA system, or uses the default screen mode. You can specify an alternate file viewer as well as name default search directories.

THE COLOR SETTINGS

SHOWDUPE.INI's settings have the form *name=value*, where *name* designates the name of a setting and *value* is the value of that setting. Thus

```
DeskTopBackGround=LIGHTGRAY
```

specifies the LIGHTGRAY color for the DeskTopBackGround setting. This is true for all settings in SHOWDUPE.INI.

You can specify BLACK, BLUE, GREEN, CYAN, RED, MAGENTA, BROWN, or LIGHTGRAY for foreground and background color settings. You can also use DARKGRAY, LIGHTBLUE, LIGHTGREEN, LIGHTCYAN, LIGHTRED, LIGHTMAGENTA, LIGHTYELLOW, and WHITE for any foreground setting. (Theoretically, you can also use these colors for background settings, but they cause the background to blink.)

The six color settings are ScreenBackGround, ScreenForeGround, DeskTopBackGround, DeskTopForeGround, WindowBackGround, and WindowForeGround. ScreenBackGround and ScreenForeGround control the color of the title bar and status lines at the top and bottom of the screen. The DeskTop settings control the colors of the desktop that appears under the windows, and the Window settings control the window colors.

OTHER SETTINGS

The ScreenMode setting specifies whether the program runs in 43- or 50-line mode on an EGA or VGA system. If you don't have such a system, or just want SHOWDUPE to use the default video mode, set ScreenMode to DEFAULT:

```
ScreenMode=DEFAULT
```

To force SHOWDUPE into EGA or VGA mode on such a system, set ScreenMode to EGAVGA as follows (the setting is ig-

nored on other systems):

```
ScreenMode=EGAVGA
```

Another setting, Viewer=, lets you override the default file viewer, SMOOTH.COM, if you don't have SMOOTH.COM or prefer another file viewer. I've used this setting to load an editor like BRIEF or *PC Magazine's* TED.COM. Just specify the name of the program:

```
Viewer=TED.COM
```

You don't need to specify the directory that the program resides in, as long as the program is in a directory in your PATH.

SHOWDUPE.INI

```
; SHOWDUPE.INI RHS 12/1/91
; Use this file to modify SHOWDUPE's settings.

ScreenMode=DEFAULT
ScreenBackGround=BLUE
ScreenForeGround=WHITE
DeskTopBackGround=LIGHTGRAY
DeskTopForeGround=BLUE
WindowBackGround=BLUE
WindowForeGround=YELLOW
Viewer=SMOOTH.COM
SearchDirectories=
```

Figure A: This initialization file lets you customize a number of SHOWDUPE's settings, including color, file viewer, and standard search directories.

Finally, the SearchDirectories setting lets you specify the default search directories for building duplicate file tables. Internally, SHOWDUPE defines this setting as NULL. You can override it by specifying one or more search directories. For example

```
SearchDirectories=c:\bin d:\bin
```

If you specify search directories on the command line, they will override the settings found in SHOWDUPE.INI. This lets you maintain a set of default search directories in SHOWDUPE.INI, but you can change them at any time via command line arguments.

In short, SHOWDUPE.INI makes SHOWDUPE far more flexible and fun to use.

screen lists the various commands for operating SHOWDUPE. In addition to using the arrow keys to navigate the listing of duplicate filenames, you can use Home and End to go to the top and bottom, and PgUp and PgDn to jump through a screenful of filenames at a time. As you move the highlight bar through the list, the full path for the highlighted file appears in the Path window near the top of the screen.

When you are ready to delete a duplicate file, scroll to that filename and press the Del key. SHOWDUPE will delete the file and gray its entry in the list box.

You can tag multiple files by moving the highlight bar to each filename and pressing the Spacebar. SHOWDUPE will change the color of every entry that is tagged for deletion. If you change your mind and wish to untag a file, move the highlight bar to that entry and hit the Spacebar again; it will act as a toggle, and the color of the entry will return to normal. Once you have tagged all of the files you want to delete, press F7 (Purge) to delete all of the tagged files simultaneously.

You can view a file with a separate file-viewing utility such as SMOOTH.COM (Michael Mefford's file viewer, which appeared in the Utilities column, February 14, 1989). SMOOTH scrolls a file on-screen. If you have a copy in a directory on your path, before deleting a file, highlight the filename and press Enter: SHOWDUPE will invoke SMOOTH and let you view the file. If you don't have SMOOTH.COM, you can download it from SOFTLIB, or Library 2 of the UtilForum on PC MagNet.

While SHOWDUPE uses SMOOTH

as its default file viewer, you can use an alternate file viewer if you prefer, such as Vern Bueg's LIST. Just modify the Viewer= entry in SHOWDUPE.INI. This initialization file lets you customize a number of SHOWDUPE's settings.

While SHOWDUPE's list box may indicate that two files have the same name, date, time, and size, they still might not be identical. How can you be sure they're really different? SHOWDUPE lets you perform a simple byte-by-byte comparison. Highlight the first filename, press F10, highlight the second filename, and press F10 again. SHOWDUPE will compare the contents of the two files and display a message telling you whether they are identical or not.

When you delete a file with SHOWDUPE, it does not disappear from the list box but simply appears grayed out. Therefore, after you've deleted a large number of duplicate files, you may wish to rebuild the .IDX and .DAT tables. Searching through a long list of files that have already been deleted isn't efficient. Select F9 (Build) and SHOWDUPE will rebuild the tables and update the list box.

The Build command can also come in handy if you started deleting files with SHOWDUPE but didn't finish the task. When you run SHOWDUPE at a later date, it will redisplay the listing of duplicates exactly as you left it. However, it will not account for any new files you've created, new program files you may have loaded that may have created duplicates, or files you've deleted since the last time you ran SHOWDUPE. Hit F9, and

**SHOWDUPE uses
two object classes,
FindDupe and
ChkDupe, to find and
display duplicate files.**

SHOWDUPE will rebuild the tables, finding any new duplicates. To abort the table-building process, press any key.

At any time, you can press Ctrl-Enter to shell out to DOS from SHOWDUPE. Simply type Exit to return.

HOW SHOWDUPE WORKS

SHOWDUPE is written in C++ and is PC Magazine's first C++ utility. While C++ has been around since the mid-1980s, it has become popular among PC programmers only during the last 18 months, largely due to the success of Borland C++ and its predecessor, Turbo C++. With both Borland and Microsoft offering C++ compilers, it won't be surprising to see C++ overtake C as the most popular application development language during the next year. C++ is simply a better C, whether or not you take advantage of its object-oriented features.

(If you are interested in the details of the object classes used in SHOWDUPE, see the accompanying Lab Notes column, "Anatomy of a Utility: Writing Applications with C++.")

SHOWDUPE has two primary missions: to find duplicate files on one or more disks; and to display them for selection, viewing, and deletion by the user. To do this, SHOWDUPE uses two object classes: FindDupe and ChkDupe.

FindDupe is the class that builds DUPES.IDX and DUPES.DAT, the files that contain the tables of duplicate files. It finds the duplicate files, sorts them, eliminates instances of solitary (nonduplicate) files, and writes out the two files.

FindDupe is derived from a simple class, RecursiveFileFind. When you supply a RecursiveFileFind-derived object with a directory name and file specification, it will search through that directory and all of its subdirectories for the requested files. To record the information on each file found, RecursiveFileFind requires



Figure 1: SHOWDUPE finds all duplicate files on one or more drives, organizes them, displays them in a list box, and lets you interactively view, compare, select, and delete them.

the implementation of a pure *virtual* function, `PostResults`. Since `PostResults` is pure virtual, `RecursiveFileFind` is an *abstract* class: You cannot create a `RecursiveFileFind` object, but only objects of classes derived from `RecursiveFileFind`. Consequently, `FindDupe` is derived from `RecursiveFileFind`, and it must supply the implementation of the `PostResults` function.

The version of `PostResults` supplied by `FindDupe` searches each directory you specify on the command line or in the initialization file and writes the file information to two temporary tables, one for the filenames and the other for the directory name, date, time, and file size.

Next, `FindDupe` reads the filenames back into memory for sorting. It places them in far memory and maintains an array of far pointers to them. Then `FindDupe` instantiates a `Sort` object to sort the array (it actually sorts only the pointers in the array). Once the array has been sorted, `FindDupe` writes the filenames out to `DUPES.IDX`, omitting solitary filenames. Then it creates the `DUPES.DAT` file, containing the file information for the duplicate files stored in `DUPES.IDX`.

Once this process is complete, the `ChkDupe` object class takes over. `Chk-`

`Dupe` is the class that really drives `SHOWDUPE.EXE`. It instantiates a `FindDupe` object when one is needed to build or rebuild the data files, but most of the time that you're running `SHOWDUPE`, `ChkDupe` is in charge.

`ChkDupe` is derived from a host of classes that are described in detail in the accompanying Lab Notes. These classes control the keyboard and screen and offer file-handling facilities. One particular class, `StandardApplication`, is composed of several of these: When a program creates a `StandardApplication` object, the program immediately gets access to the keyboard, fast screen routines, and the look of a "desktop-based" program like Symantec Corp's *Norton Commander* or the integrated development environment of Borland C++. A `StandardApplication` object can make use of windowing and other facilities provided by these classes.

Since `ChkDupe` is derived from `StandardApplication`, the screen is immediately transformed into the desktop background that appears behind the `SHOWDUPE` windows. `ChkDupe` itself creates three windows: One, which contains the file path, is a `Window` object; another,

containing the list of duplicate files, is an instance of an object class called `MyScroller`. The third, the status window, derived from the `Window` class, displays the program's status and the filenames scanned as the duplicate file tables are built.

Via C++'s multiple inheritance, `MyScroller` is derived from both `Scroller` (itself derived from `Window`) and `Dupes`, an object class that creates `File` objects to manage each of the tables used by `SHOWDUPE`. `Scroller` provides a list box drawn in a window, and `Dupes` offers facilities for accessing the duplicate file tables. `MyScroller` uses member functions it inherits from `Scroller` to display and manage the list box, and it draws from `Dupes'` member functions to read and update the tables.

When you press a key while running `SHOWDUPE`, the `ChkDupe` object receives the keystroke from its inherited keyboard functions. If it cannot use the key itself (to exit or to invoke `SMOOTH` or `COMMAND.COM`), it passes the key to a `MyScroller` member function, `KeyProcess`. This function evaluates the keystroke and adjusts the contents of the list box, if necessary (after all, the list box is simply a "view" of a subset of records in the duplicate file tables). Then it calls the appropriate `Scroller` member functions (`Home`, `End`, `Up`, `Down`) to update the list box. If the `ChkDupe` object receives a `Del` or an `F7` key, it calls `MyScroller::Delete()` or `MyScroller::MassDelete()` to delete the appropriate file or files.

When you run `SHOWDUPE`, you might notice that if you tag a file for deletion, it stays tagged until you untag it or delete it, even if you exit the program and restart it. That's because `MyScroller` changes an attribute byte in the file's record in the duplicate file tables. While `Scroller` can only manage the list box (it knows nothing about files), and `Dupes` can access and manipulate the duplicate files tables (it has no knowledge of the screen or keyboard), `MyScroller`, derived from both, can change the look of a tagged file entry in the list box while updating the entry's attribute byte in the table.

I hope you'll find `SHOWDUPE` a helpful tool. Since creating it, I've been busily deleting duplicate files, which seem to clutter my hard disk faster than I can delete them. ■

Richard Hale Shaw is a contributing editor of PC Magazine.

DOWNLOADING UTILITIES

The programs published in *PC Magazine* are available by modem from PC MagNet, our on-line service.

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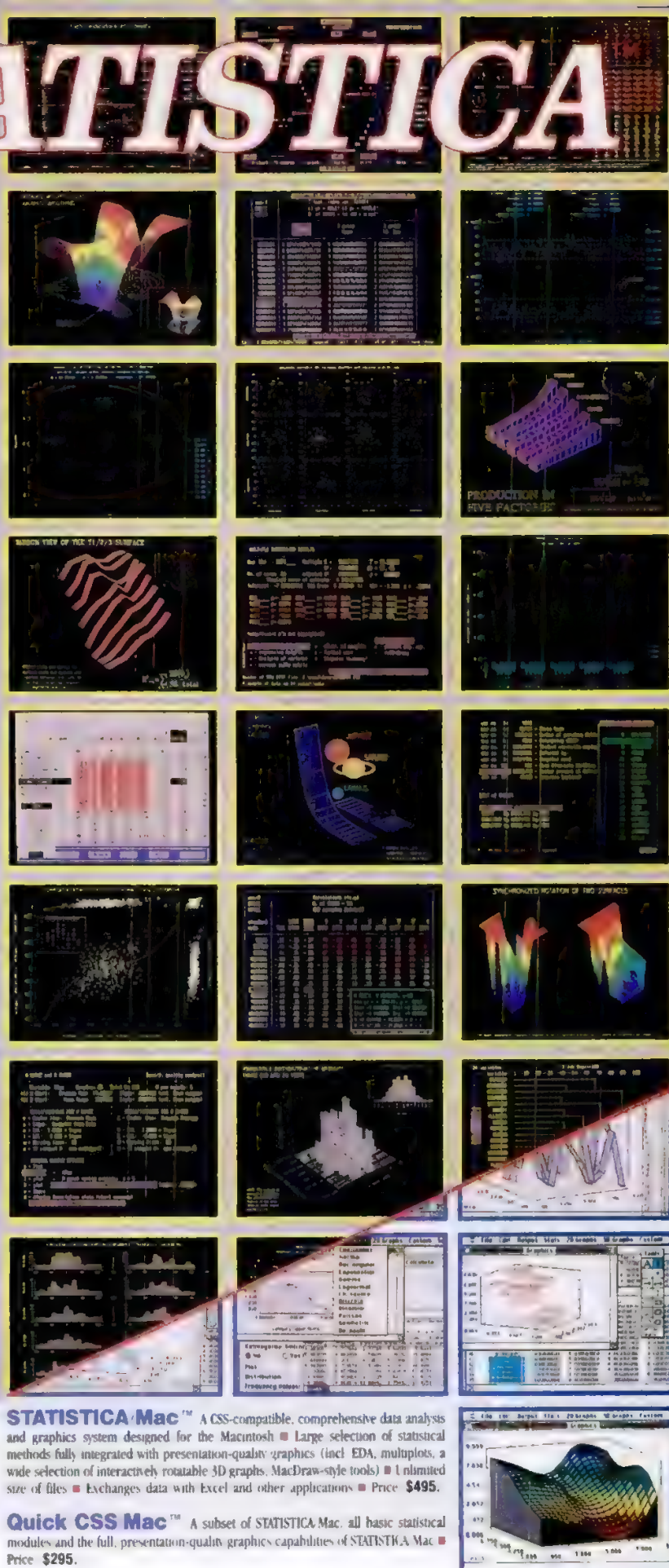
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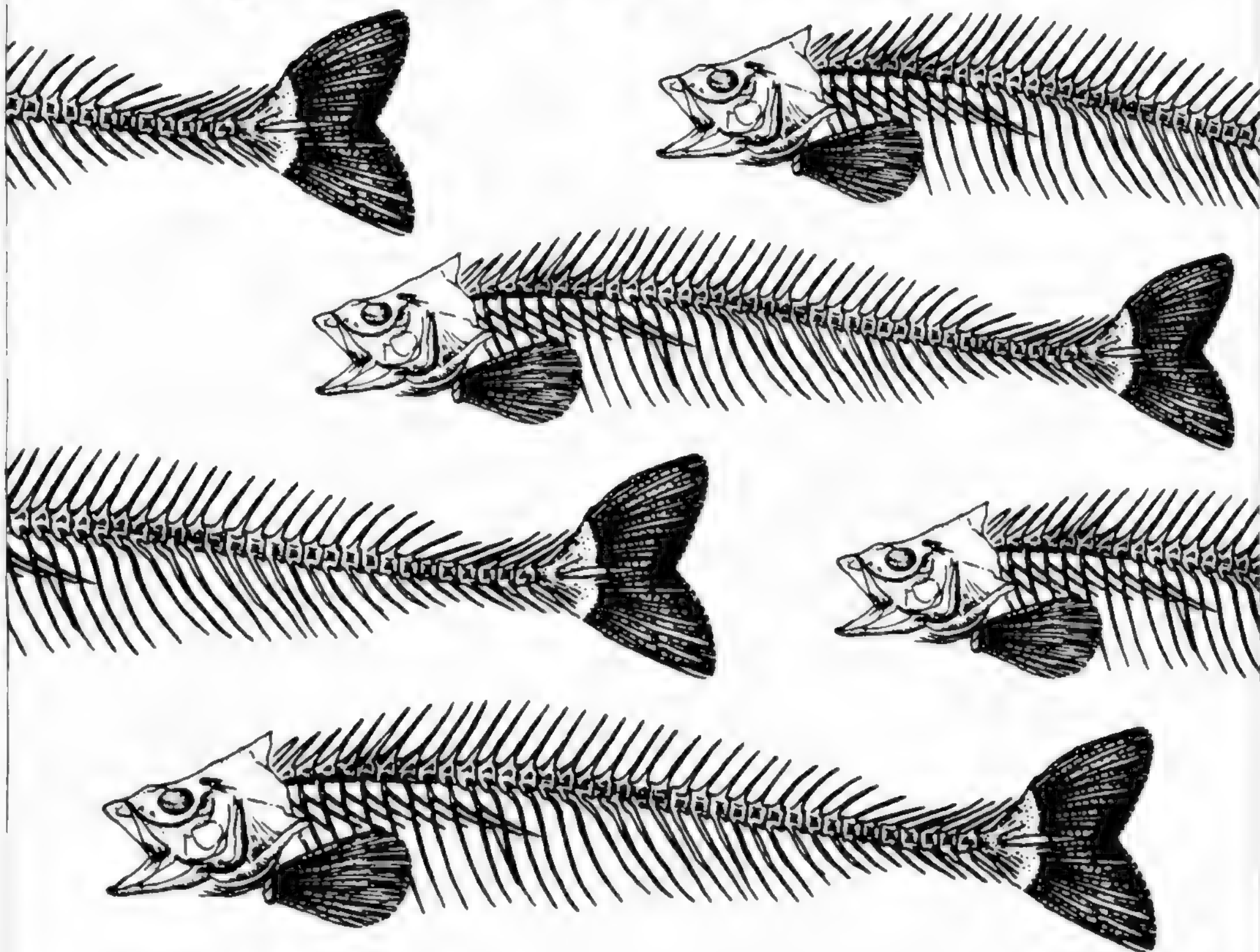
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by
Richard Hale Shaw

Lab Notes

"There's no such thing as a programming object," a reader protested some years ago. "You have data and you have code—that's it."

Today, of course, the word is not the issue. *Objects* simply designate useful, powerful units into which the raw materials of programming—code and data—are organized. The popularity of object-oriented programming is the direct result of the power and convenience of using the simple, easy-to-maintain, reusable program modules known as objects.

This Lab Notes presents a look at C++, both as an application development language and as an illustration of the philosophy of object-oriented programming. I'll examine how C++ works, why it works, and what its benefits are. If you're not a C programmer, my purpose will be to explain the power of object-oriented programming, using code examples from SHOWDUPE.EXE, which is presented in this issue's Utilities column. If you are already a C programmer, my purpose is to show you that C++ is, simply, a better C than C.

In addition to reading the Utilities column on SHOWDUPE, you'll also find useful background material in Ray Duncan's excellent "Power Programming" column. In a series of four issues (July 1991, August 1991, and September 10 and 24, 1991) he introduced a number of C++ key features such as:

- Stricter type checking, in addition to forcing you to use function prototypes.
- The ability to create local variables anywhere in a function, not just at its inception.
- The ability to create objects, whose inner workings are hidden and which can be changed without affecting the object's users.
- The ability to derive new classes from existing ones via *inheritance*.
- Operator and function overloading, which allows you to customize an object class and make it more convenient to use.
- The ability to create *friend* classes and

Anatomy of a Utility: Writing Applications With C++

■ Here's an explanation of the advantages of C++ over traditional C programming as applied to the SHOWDUPE utility in this issue's Utilities column.

functions that can access an object's components without having to make them part of a derived class.

THINKING IN TERMS OF OBJECTS

Object-oriented programming organizes and classifies information in a basically different way than does traditional, procedural programming. In procedural programming you say to the machine, "Do this . . . now do that . . . now do something else." Assembly language, Pascal, BASIC—and C—are all designed on the model of taking the machine by the hand and leading it step by step through all the tasks that have to be completed to produce the program's results. Along the way, to reduce the programmer's work load, these languages offer functions, procedures, and subroutines that package together some of the procedural steps.

But they don't go far enough: Actual program processes and tasks include *data*, not just functions and procedures. Whether you are performing file I/O, opening windows on-screen, managing the serial port, or printing, every task requires specialized functions that operate on specific data

items. With functions alone there is no inherent relationship between code and data; they remain isolated, concrete units that you must manually bind together to create programs.

Object-oriented programming, on the other hand, takes the extra step and binds code and data together. This process, called *encapsulation*, is one of the bases of any truly object-oriented language. Encapsulation marries code and data, thus creating a more powerful, useful unit that encompasses *all* the details of a process or a task. Such modules, or objects, can be dedicated to performing specific tasks, and if they are well designed you don't need to know how they work in order to use them. You need know only what services an object provides and how to activate those services.

In object-oriented languages, such as C++, Turbo Pascal, and Smalltalk, you don't create an object by itself. Instead, you create an object *class* and then *instantiate* it by producing an object (an *instance*) of the class. The class is simply a template or outline that includes, first, data members that store information about the objects in a class, and, second, member functions that can act on this information. A *member function* is a function that is declared within the class definition and is tightly bonded to that class type. (In other object-oriented languages, it is known as a method.) The *class definition* includes all the features that define an object of the class. Thus, a class binds together the features of every object of the class while allowing each object to differ from any other in its data content.

Inheritance is the second foundation of object-oriented languages. Inheritance lets you define one class in terms of another. Thus, when you *derive* a new class from an existing one, the new class "inherits" all the features and facilities of the parent class.

APPLYING OOP CONCEPTS

To explain these ideas more clearly, let's suppose that you're designing a windowing library. In a traditional, procedural programming language such as C you'd make a set of functions that create, open, close, move, and size windows on-screen:

```
int win_create(...);
int win_open(...);
int win_close(...);
int win_move(...);
int win_size(...);
```

These functions would use variables to track the window's position, size, color, and so on:

```
unsigned char color;
int top, left, height, width;
```

If you want to use the functions to open more than one window, you'll create a structure that binds the variables together and pass the address of that structure (via a pointer) to each window function, as shown in Figure 1.

There are a number of limitations with this approach. First, there's no way to cement the relationship between a spe-

cific WINDOW pointer and the appropriate function automatically; you must undertake that task manually. Thus, you have to keep track of the WINDOW pointer, call a specific function, and pass it specific information.

Second, there's very little opportunity to hide the mechanisms being used: for example, the contents of the structure and what each function does to or with them. You may ask: Why hide them? The mechanisms may be proprietary. And, as we all know, some developers write applications that rely all too closely on the underlying mechanisms: The more programmers know about the mechanisms' inner workings, the more they'll take advantage of them. Thus, you may want to reduce the visibility of an application's components.

True, as shown in the example, you can allocate the structure dynamically when you create the window, return the pointer, and let the caller use the pointer as a handle to the window. (This will sound familiar to Windows programmers, even though handles are not pointers, but an index into a table of pointers.) But there's little to ensure that you will always pass the right handle to the right function.

Third, on this approach, how do you extend the window function library? You can modify the functions themselves in an attempt to make them more generic. However, that can quickly become a nightmare, an endless process. Or you can make a copy of them and modify them. But that means a lot of code duplication. Or you can build *wrapper* functions, that is, functions that your program calls and which, in turn, call the functions in the library.

THE C++ APPROACH

C++ offers a better solution. In a C++ program you start by creating a class: I'll call it Window. The Window class will contain data members that define the parameters of a window: screen coordinates, height, width, color, and so on. It will also have member functions for opening, closing, moving, and sizing the window. The process is illustrated in Figure 2. (C++ aficionados will note that for simplicity I've omitted constructor, destructor, and public-private designations.)

Since classes are only a template for instantiation—that is, for creating an object—the class doesn't specify all the features of every object. The data members

A WINDOW CLASS IN C++

```
class Window
{
    BYTE    color;
    BYTE    top;
    BYTE    left;
    BYTE    height;
    BYTE    width;
    .
    .
    .
    void Paint(void);
    void Open(void);
    void Close(void);
    void Move(int newtop,
              int newleft);
    void Size(int newtop,
              int newleft,
              int newheight,
              int newwidth);
    .
    .
    .
};
```

Figure 2: Rather than juggling functions and structures, you create a class that encapsulates windowing functions and their data into a single unit.

of a class simply describe what will be in the object. Only in an instance or object of a class will these data members have a particular value. Thus, the Window class definition simply includes a variable to hold the window's color value; the specific color value of each Window object is specified in that object. But since each object of class Window has a color attribute, the Window member functions that use that attribute can operate on every object of the class in a uniform way.

The first advantage of the C++ approach, then, is that the data members of an object are accessible only to that object's member functions unless you explicitly say otherwise. Second, the class member functions can directly reference the data members of a particular object: they'll automatically know to use the data members of the object instance that called them.

You might, for example, create two Window objects, WinA and WinB, and call the Window class's Open member function for each of them:

```
Window WinA;
Window WinB;
.
.
.
WinA.Open();
WinB.Open();
```

WINDOWING IN C

```
typedef struct _window
{
    BYTE    color;
    int     top;
    int     left;
    int     height;
    int     width;
    .
    .
    .
} WINDOW;

WINDOW *w;

.
.
.
if(w = win_create(BLUE,5,5,10,10))
    win_open(w);
```

Figure 1: Using a structure, you can bind data items together; but there's no way to strictly associate the data items with particular functions.

With the call to `WinA.Open()`, the `Open` member function knows to use `WinA`'s, not `WinB`'s, data members. There's no possibility of a member function getting the wrong data, as there would be with a windowing library written in C (or any other procedural language).

Die-hard opponents of object-oriented programming may ask at this point, "Can't you do all this with pointers? If you put pointers to functions in your data structures, why do you need classes?"

The answer is that if you used pointers to functions in a C structure, you'd have to initialize them every time you created a new copy of the structure. And you'd still have to pass the structure address to each function: How else would the function know upon what data to operate? And what would happen if you had a similarly named function (for example, `winopen`) that you mistakenly called instead of the right one? There would be no protection against using the wrong data with the wrong function.

Moreover, with C, you would still have to keep all the function names separate (`win_open`, `file_open`, and so on). In C++, however, different object classes can use the same names for member functions without colliding. For instance, if both the `Window` and `File` classes have a member function called `Open`, they will never get confused because you always reference them via a specific object:

```
Window A;
File B;
.
.
.
A.Open(); // opens the window
B.Open(); // opens the file
```

The `Open` member function in the `Window` class has an entirely different meaning from the one in the `File` class.

REUSABILITY AND C++

Perhaps the most significant advantage of C++ over C and other procedural languages lies in the area of reusability. Earlier, I noted that you can use wrapper functions to extend a C library. With wrapper functions, however, you still have no protection against calling the wrong function with the wrong data. Further, you must keep track of the data for the functions that are being wrapped. And if you build new functions, you eventually end up duplicating the functionality of your

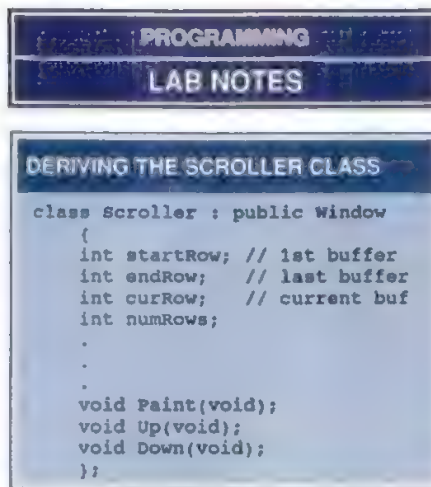


Figure 3: Rather than create a new class from scratch, you can derive the `Scroller` class from the `Window` class. Objects of the new class will have all the features of `Window` objects—plus the features added to them by the `Scroller` class definition.

existing window functions. That increases the code size unnecessarily.

In C++, you can use inheritance to build an *integrated* set of components that avoid these problems. As you can see in Figure 3, to create a list box or scroller you simply create a new class, `Scroller`, that is derived from the previously described `Window` class.

In Figure 3, the line

```
class Scroller : public Window
```

shows that `Scroller` is derived from `Window`. Consequently, `Scroller` inherits all the member functions and data members of the `Window` class.

The `Scroller` class adds variables to track the rows of text displayed in the list box. And the `Up` and `Down` functions let you scroll the displayed items in response to input from the user. Since `Scroller` defines its own `Paint` function, the `Paint` member of `Scroller` overrides `Window`'s `Paint` function, thus:

```

Scroller S;
Window W;
.
.
.
S.Paint(); // Scroller::Paint
W.Paint(); // Window::Paint

```

In this example, a call to `S.Paint` calls `Scroller::Paint`, that is, the `Paint` member function defined in `Scroller`, not the one in `Window`. (The C++ scope resolution operator `::` is a common way of designating the class to which a data member

or member function belongs.) `W.Paint`, of course, calls `Window::Paint`.

You can see, therefore, how inheritance lets you add features to a class by extending it from below. You simply derive a new class from the old one and include the features and facilities you want to add. The new class will have all the power of the original class plus those data members and member functions added in the new class's definition.

The benefits of inheritance are not limited to extending a class definition from below. While the technique is slightly more unusual, you can change the definition of an existing class and add a new class to its ancestry, thus using inheritance to add facilities to a class from above.

The `Window` and `Scroller` classes I've outlined here are simplified versions of the correspondingly named classes I created for `SHOWDUPE`. As I developed the `Window` class, I realized that each `Window` object would need information about the screen environment on which it displayed itself. This brought up an interesting design problem: Where was this information to be stored?

I decided inheritance was the solution. In C++, the `static` keyword has a different meaning from its use in C. In C, when applied to a local data member, `static` means that the data member has the life of a global variable while its scope remains local. Applied to functions or global variables, `static` restricts the visibility of the item. Thus, a `static` function cannot be called outside the module in which it is declared, and `static` variables cannot be accessed outside that module.

When you apply `static` to a data member in C++, only one copy of the data member is created for the entire class. So I created the `Screen` class with `static` data members. That way, only one copy of each is created for every member of the class—even for members created via derived classes. And thus, I was able to derive `Window` from `Screen`.

Consequently, even though `Window` and `Scroller` are derived from `Screen`, `Screen`'s data members exist only once for each `Window` or `Scroller` object. Try to do that easily, in a reusable form, in C!

UNDERSTANDING SHOWDUPE

If there's anything I've learned from my experiences with C++, it's that C++ spells convenience. Bjarne Stroustrup, its creator, must have sat down and tried systematically to resolve every major inconven-

SHOW DUPE'S CLASS HIERARCHY

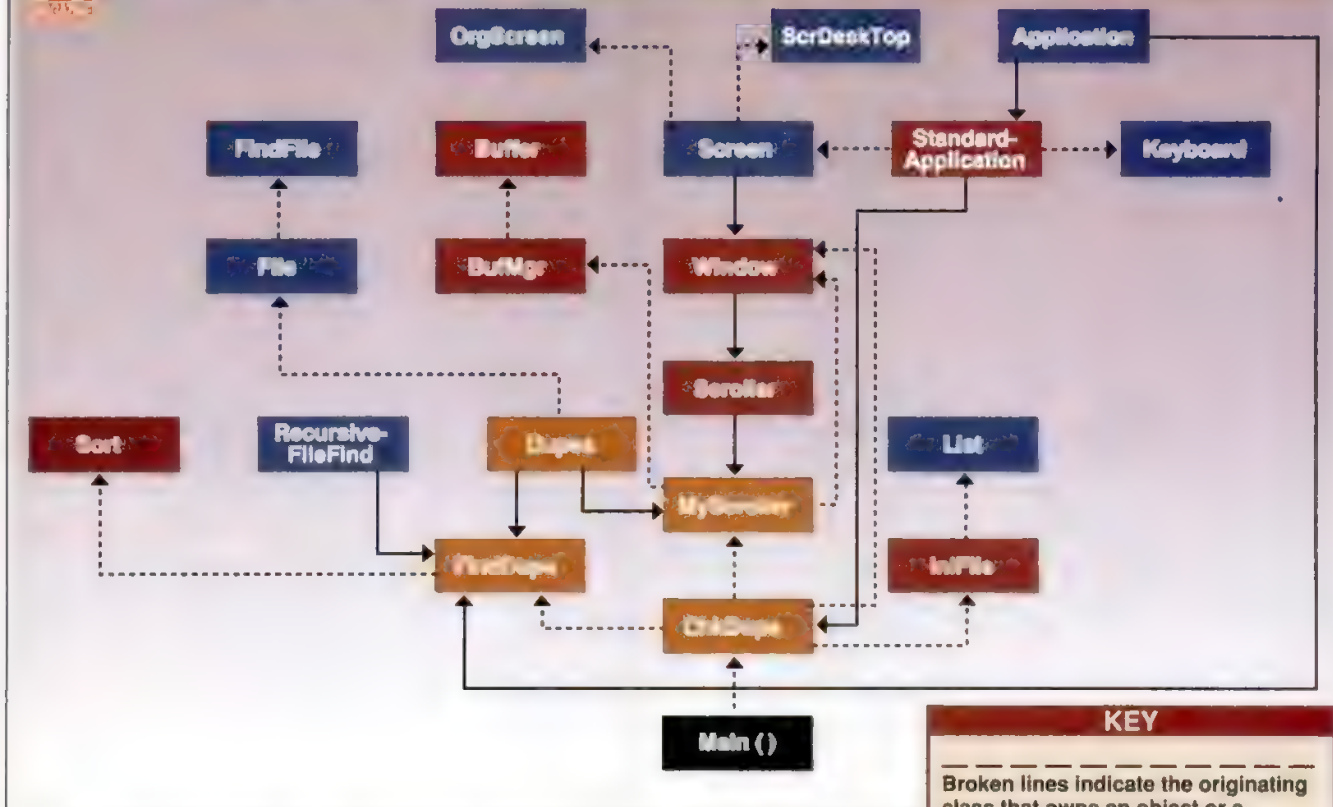


Figure 4: This hierarchy diagram depicts SHOWDUPE'S classes and their relationship to each other. Base classes have no ancestors, intermediate classes provide solutions to specific problems, and application-level classes pertain to a particular program.

KEY

Broken lines indicate the originating class that owns an object or a pointer to an object of the class.

Solid lines indicate that the terminating class is derived from the originating class.

Base classes

Intermediate classes

Application-level classes

ience of working in C! As I discuss the inner workings of SHOWDUPE and the object classes on which it is built, I'll point out in passing how C++ made it easier to design each component and put together the application.

SHOWDUPE is based on 20 classes. Nine are base classes—classes that have no ancestors. Seven are intermediate classes—neither base classes nor application-specific—but designed to provide specific solutions to problems. Four are application-specific to SHOWDUPE.

Of the base classes, four provide a structure, an "application framework," so to speak. While not nearly as comprehensive as the application frameworks of C++ libraries from Blaise, Borland, Microsoft, and others, these classes give SHOWDUPE (and any application that uses them) the capability to:

- Get and Set the screen mode and all parameters.
- Save the user's screen at start-up and

restore it before terminating.

- Provide a standardized facility for retrieving keyboard input and identifying keystrokes.
- Provide a standardized mechanism for retrieving program arguments and switches, regardless of their order on the command line.

The Screen, Keyboard, and Application classes, together with SHOWDUPE's class hierarchy, are shown in Figure 4. To bring these classes together into a single unit, I created the StandardApplication class. This class is derived from Application, and it contains a Screen object and a Keyboard object. It will be useful to look at these classes in slightly more detail.

THE SCREEN CLASS

If you study the listing SCREEN.H, you'll find that the first half is full of statements such as

```
const VID_BLACK = 0;
```

As with the static keyword, C++ uses const much differently than C does. In C++ const is a means of creating a constant value. It is much like a C #define except that C++ will perform greater type checking on const variables.

The header file also includes several in-line functions, such as

```
inline WORD MakeCell(BYTE c, BYTE
color)
{
    return (WORD)((color << 8)+c);
}
```

This function returns a 16-bit word that contains a color attribute in its high byte and a character in the low byte. You can use the function to create a character-

THE SETWORDS AND CPYWORDS FUNCTIONS

```

void near pascal SetWords(void far *addr, unsigned val,
    unsigned len)
{
    asm les     di, addr
    asm mov     cx, len
    asm mov     ax, val
    asm cld
    asm rep     stosw
}

void near pascal CpyWords(void far *dst, void far *src,
    unsigned n)
{
    asm mov     dx, ds
    asm les     di, dst
    asm lds     si, src
    asm mov     cx, n
    asm cld
    asm rep     movsw
    asm mov     ds, dx
}

```

Figure 5: These are the two workhorse functions for screen I/O used by the Screen class. They can set and copy data at high speed using word-by-word transfers.

attribute cell, such as those found in the screen buffers at segment B000h and B800h. The C++ compiler doesn't guarantee that such functions will become in-line code—but it will try. And just as with `const` variables, in-line functions offer greater type checking than C macros (which provide none).

Screen's data members are `static`. Thus, they're available to every class derived from Screen but, unlike nonstatic data members, they're not duplicated in every instance of the class. The `static` keyword is applied to the member declarations in the class definition:

```
static char far *buffer;
```

Since such variables are not created with each new instance of the class, however, you must define them in a source code file. The line

```
char far *Screen::buffer;
```

instantiates this data member of the Screen class.

The Screen class provides functions that set and retrieve the screen mode, set the cursor position and size, return the screen dimensions, and paint the screen. It also offers facilities for reading and writing to the screen. The Screen class supports EGA, VGA, and monochrome screen configurations. While SHOWDUPE can be used in programs that run on CGA systems, the screen I/O routines write directly

to the screen buffer without snow checking. This both simplified the design of Screen and made its routines fast. And of course, the CGA is a video standard that is quickly disappearing.

One complaint about OOP languages generally is that they introduce too many layers, thus reducing an application's performance. This is not true of C++. For instance, most of the screen I/O performed by member functions of Screen is carried out by the two functions shown in Figure 5. SetWords and CpyWords are declared in SCREEN.H and are found in SCREEN.CPP even though they are not members of the Screen class.

Both these functions operate on memory buffers that have the attribute-character format of the screen buffer. SetWords is used to set all the cells of a screen buffer to a specific cell value. Note that it is written in in-line assembler, uses the pascal calling convention, and propagates copies of the cell throughout the memory buffer via the REP STOSW instruction. This makes it extremely small, fast, and efficient.

CpyWords is similar. It copies the contents from one memory range to another, using REP MOVSW for copying 16-bit words. By using these two functions I've been able to obtain relatively fast screen I/O performance for SHOWDUPE.

I placed these functions in SCREEN.CPP because that's where they were most likely to get used. These two functions could have been made members of the Screen class, but I didn't want to limit them to Screen or its derivatives. Moreover, I wanted to keep them as efficient as possible. The connecting glue between C++ member functions and their data members is an invisible pointer to the object for which they are used, and I saw no need to encumber these functions with the extra pointer.

The Screen class has two other interesting features: an object of type OrgScreen and a pointer to an object of type ScrDesktop. The OrgScreen object retains all the information about the user's screen when the program starts, including a copy of the screen image. Thus, Screen can use the OrgScreen information to save and restore the screen image and mode. The ScrDesktop object creates a "desktop" look on-screen, with a bar for menus and status at the top and bottom and a textured character over the rows in-between. (If you find this reminiscent of the Borland C++ IDE, you're right: It's a deliberate imitation.) As a result, Screen can optionally, automatically provide an application with a contemporary desktop look that pops up.

The StandardApplication class creates a Screen object as one of its data members, initializing it via

```
screen.Init();
```

While Screen::Init actually takes three parameters, C++ lets you supply default parameters in a function prototype, as shown in Figure 6. If the arguments are missing when such a function is called, the compiler will fill them in from those specified in the prototype. Consequently, a call to Screen::Init without any param-

C++ DEFAULT FUNCTION PARAMETERS

```

void Init(int newmode = VIDMODE_DEFAULT,
    BYTE desktop_colors = SCR_DEFAULT_DESKTOP_COLORS,
    BYTE screen_colors = SCR_DEFAULT_COLORS);

```

Figure 6: C++ lets you provide default parameters to a function, by specifying them in the function prototype. If you fail to provide these function arguments at a function call, the compiler will substitute these for you.

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eters will result in its initializing a Screen object with a set of default values.

While StandardApplication initializes its Screen object in this way, a *virtual* function, another convenience of C++, lets you override these parameters in an object derived from StandardApplication. Here's how it works. Every application that is derived from StandardApplication must call StandardApplication's InitApp function to initialize the StandardApplication portion of the derived object. The requirement thus includes the Screen object. The function is defined in StandardApplication like this:

```
virtual void InitApp(void)
{
    screen.Init();

    screen.Paint();
}
```

In this case, screen.Init() initializes the StandardApplication Screen object, and screen.Paint() causes the Screen object to paint the screen and the desktop. An application that doesn't want to override the values passed to Screen::Init need only call InitApp and be done with it. But if an application wants to override StandardApplication::InitApp, it can provide its own version of the function. A virtual function is a little like the Miranda warning, "If you cannot afford an attorney, one will be provided for you." In the case of InitApp, if you do not provide a version of your own (in a class derived from StandardApplication), one will be provided for you.

This is just one example of how these classes use virtual functions. An even more powerful example, one that uses *polymorphism* or "late binding," is discussed below in connection with the Scroller class.

THE KEYBOARD CLASS

KeyBoard is a relatively trivial class, but it provides two services I've found helpful when writing DOS-based applications. First, it simplifies the process of obtaining keystrokes from the keyboard. Traditionally, an application calls getch() or another library function. If getch() returns zero, a function key (or some other non-ASCII-generating key) was pressed. You then have to retrieve the function key's keyboard scan code. The Get() function in KeyBoard provides just this service.

The need for the other KeyBoard service is a consequence of using both keyboard scan codes and ASCII values in the same application: Scan code values overlap those of ASCII values. KeyBoard solves this problem by providing a set of const integer values that the application can use without confusing them with ASCII values. As defined in KEYBOARD.H, the const values use an in-line function SCANCODE to set the 9th bit (from the right—the low bit of the high byte), thus removing it from the range of ASCII values:

```
inline WORD SCANCODE(WORD u)
{
    return (u | 0x0100);
}
```

This way, an application can use const values such as KEY_HOME, KEY_END, KEY_PGUP, KEY_PGDN, KEY_UP, KEY_DOWN, and so on, with KeyBoard::Get to evaluate values returned from the keyboard.

One last note on KeyBoard. At some point, I'd like to beef up the inner workings of this class so that it directly calls INT 16h (the keyboard interrupt) instead of calling getch(). And, I'd like to add keystroke buffering beyond that offered by DOS. KeyBoard is designed so that it can be modified to include these changes without necessitating any change in applications that use it.

Using a descendant of KeyBoard, an application could effectively take full control of the keyboard, if need be. For instance, a class derived from KeyBoard might want to implement keystroke recording and playback or perform background processing in-between keystrokes. (I'm actually planning the latter in a future incarnation of KeyBoard.)

THE APPLICATION CLASS

This class is slightly more complex than KeyBoard, but it vastly simplifies the process of retrieving program command line arguments. After years of C programming, I've got some settled grievances against the traditional argc and argv arguments to main(). First, argv, which is a pointer to an array of pointers, can be awkward to use: You have to loop through the pointer array, evaluating and parsing arguments and switches, being careful not to go beyond the last argument.

Second, the program arguments are available to main() only if you pass them to another function from main(). (Some

compilers do provide global versions of these, however.) Third, I have repeatedly found it annoying to parse and evaluate program arguments when my chief need has been simply to distinguish between command line switches (which usually begin with / or -) and other arguments. And fourth, I've found that the order of arguments is rarely important in a program; it's the number of arguments and what switches are being set that count.

The Application class resolves these problems. It makes argument processing a simple task that can be accomplished anywhere in a member function of a class derived from Application (or StandardApplication). And it automatically distinguishes between switch arguments and the others. Consequently, the order of arguments—even the convention that options must precede other arguments—can be abandoned in many cases.

The Application class's constructor (called when you first create an object of the class) automatically registers - and / as switch characters. If a switch simply toggles a value, you need only call GetSwitchArg to see if a particular switch is set. Thus with

```
APPNAME /m filename.ext
```

the GetSwitchArg member function will return TRUE if you pass it m. If the switch is followed by a value, as in

```
APPNAME /Ic:\BC\INCLUDE
filename.ext
```

you can use GetSwitchArg to retrieve the value that follows a particular switch. Both functions return NULL if the switch isn't found.

The Application class uses C++ function overloading to define two GetSwitchArg functions. This is impossible in C, since two functions with the same name cannot have the same scope. In C++, however, you can have more than one same-named function in the same scope as long as the number and types of their arguments differ. Thus, the Application class includes

```
BOOL GetSwitchArg(char c);
char *GetSwitchArg(char c, char
*buf);
```

where the first function returns TRUE if a switch is set, and the second function returns the value of the switch. Using these two functions eliminates the need

to parse the command line for switches.

The Application class also offers a variety of ways to access the remaining non-switch arguments. For example, you can call GetArg and GetNextArg to process the remaining command line arguments. Or you can call GetArg with a parameter to indicate which argument you want to access. Note that these functions operate as if the traditional argv[1] is Argument(0). After all, the first item on the command line *after* the application name is the first program argument, not the program name itself.

Two other functions, GetAppName and GetArgCount, return the application name (argv[0]) and the total number of program arguments (argc-1).

THE REMAINING LOW-LEVEL CLASSES

Of the remaining five low-level classes, two supply file-handling facilities and one provides list management. The File class simplifies file handling by taking care of the details of maintaining file pointers, associating the pointers with filenames, seeing that the files are properly closed,

and so on. For instance, as shown in Figure 7, the File class's destructor automatically calls the Close member function when a File object is destroyed or goes out of scope.

Close checks the file pointer and, if it's not NULL, closes the file. Thus you don't have to worry about closing File objects that are declared in your program: They'll be closed when the object goes out of scope. (Of course, if you dynamically allocate a File object with the new operator, you will have to delete the pointer to insure that the file is closed.)

The FindFile class is perhaps the simplest one in the hierarchy. It merely calls the findfile library function and supplies the requisite structures and flags. It is used by the File class to provide file-finding services.

* The final base class is the List class. While its only use in SHOWDUPE is in the IniFile class (discussed below), it could easily be used anywhere in the program. (For example, it could be used even to store the text items displayed in SHOWDUPE's duplicate file scroller.) List implements a doubly linked list and overloads the array operator, [], to let you access the members of the list as if the list actually were an array of pointers. Thus, you can create a List object

```
List list;
```

and later access a list member via

```
printf("%s\n",list[i]);
```

A List object doesn't store an item directly. Rather, each node of the list is actually a pointer to a NODE:

```
typedef struct _node
{
    struct _node *next;
    void *object;
} NODE;
```

A List object will thus create a new NODE and then assign the NODE member object to the object being stored in the list. The idea is that a List object has no idea what kind of item is being stored—and it shouldn't care. In the case of the IniFile class, it uses List to store pointers to structures.

THE INTERMEDIATE CLASSES

I've already presented primitive versions of the Window and Scroller classes above,

THE FILE CLASS'S DESTRUCTOR

```
File::~File(void)
{
    Close();
    if(linebuffer)
    {
        delete linebuffer;
        linebuffer = NULL;
    }
    if(name)
    {
        delete name;
        name = NULL;
    }
    if(mode)
    {
        delete mode;
        mode = NULL;
    }
}
```

The Close member function,

```
void File::Close(void)
{
    if(fp)
    {
        fclose(fp);
        fp = NULL;
    }
}
```

Figure 7: A C++ destructor is automatically called when an object goes out of scope. The destructor for the File Class will call the Close member function which in turn calls fclose to close the file.

and this will simplify their discussion here. While the latter is derived from the former, both are derived from the Screen class.

Window is a simple class for displaying information in windows on-screen. While its implementation in SHOWDUPE is by no means final (I expect to add a great deal to it over the coming year), it does a great job of letting you turn a program into a windowing application. A few points on how Window works are worth noting.

First, Window takes advantage of its relationship to Screen beyond merely accessing the Screen data members that it inherits. Thus, for instance, in the Window::GotoXY member function the instance variables curRow and curCol are first set, after which Window::GotoXY calls Screen::GotoXY to position the cursor on-screen and record its position in a data member.

Window isn't dependent on Screen for everything, however: It will often complete a job by itself. For example, in the Window::Scroll function, it uses in-line assembly language to set up the video BIOS functions (INT 10h, functions 6 and 7) for scrolling the screen.

Scroller builds on the facilities of Window to display a list of text items in the window. It tracks the item number of the first and last items displayed as well as the highlighted item. To simplify its use, Scroller offers six member functions that correspond to usual keyboard actions used to manipulate a list: Home, End, Up, Down, PgUp, and PgDn. Thus if an application that uses a Scroller-derived object receives a KEY_HOME from the keyboard, it needs only to call Scroller::Home().

Note that I said "Scroller-derived object" in that last sentence: Scroller has four *pure virtual functions*:

```
virtual char *GetBuffer(int bufnum)
    = 0;
virtual BYTE GetAttribute(int
    bufnum) = 0;
virtual void SetBuffer(int bufnum,
    char *newbuf) = 0;
virtual void SetAttribute(int
    bufnum, BYTE newattrib) = 0;
```

Unlike virtual functions, pure virtual functions cannot supply a version of the function for you. You must instantiate a version of the function yourself, instead. In terms of the "Miranda Rule" meta-

phor used above, with pure virtual functions "If you cannot afford an attorney, you're out of luck." A class that contains pure virtual functions is called an *abstract class*: It cannot be instantiated. That is, you cannot create an object of that class. You can only derive a new class from it and create objects of the derived class—provided again that you yourself instantiate the pure virtual functions.

The pure virtuals here are used by Scroller to access the text and color attributes of the text in the list box. I thought it important to separate Scroller from the storage mechanism used to store the text of the list. After all, you might want to use a linked list or an array of pointers, or you might want to read the information from a database. Thus Scroller knows nothing about where the text is stored: It simply retrieves it using an integer index. The pure virtuals provide Scroller with a means of getting and setting the list items. (I'll have more to say about this below, in connection with MyScroller, the application-level class that implements Scroller.)

This is a classical example of *polymorphism* or *late binding*. Traditional C uses *early binding*, in which the compiler and linker make the connection between a function call and its code by the time the program is linked. With late binding this decision is deferred until runtime: It is only at runtime that we instantiate an object of a class derived from Scroller and provide the implementation of the virtual function.

What happens is that a hidden mechanism—built into the program by the compiler and linker—creates a table of pointers to functions. This function pointer table is used to resolve the link between the virtual function call and its code. All of this is done for you automatically; all you have to do is declare the pure virtual function and provide an implementation of it in the derived class.

Two additional intermediate classes are Sort and RecursiveFileFind. The Sort class was necessary because the standard qsort library function sorts only pointers of the same size as the memory model from which it is called. SHOWDUPE stores filenames in far memory, and rather than recompile in large model for this one function, I wrote a simple Sort class that can be used in a wider variety of settings.

The RecursiveFileFind class is also used by FindDupe. Its specific job is to

find all the files in the areas in which duplicates are to be discovered. The heart of the RecursiveFileFind class is the rff function, which actually performs the disk search by recursively searching each directory and all of its subdirectories. RecursiveFileFind has an overloaded constructor:

```
RecursiveFileFind(char *dspec, char
    *fspec);
```

```
RecursiveFileFind(void);
```

If you know what you're searching for when you create an object from a class derived from RecursiveFileFind, you can pass the parameters to its constructor at that point. Otherwise, you can call the second version, followed by a call to its Init member function

```
void Init(char *dspec, char *fspec,
    BOOL keychecking = FALSE);
```

You then call the Run member function to start the recursive search. The key-checking flag simply tells RecursiveFileFind whether it should periodically check for keyboard input to interrupt the search.

Like Scroller, RecursiveFileFind is an abstract class. The PostResults member function is a pure virtual and so must be instantiated in a class derived from RecursiveFileFind. (This pure virtual is further described in the Utilities column article on SHOWDUPE.) The PostResults function is used to give other classes access to the results of the recursive search. Since you define PostResults yourself, you can have it put the results in an array, in a disk file, on-screen, or anywhere. Because RecursiveFileFind is an abstract class, FindDupe is derived from it. FindDupe instantiates the PostResults function, which places the file information that has been found into tables, where it can be further used by FindDupe.

The last intermediate class is IniFile. This class stores and manages a program's user-modifiable settings. You can initialize it with the program's default settings and override them with those found in an initialization file, in this case, SHOWDUPE.INI. To use the IniFile class, you create an object

```
IniFile Settings;
```

and pass it the name of the initialization file that will be used

A PORTION OF THE DUPES CLASS DEFINITION

```

class Dupes
{
protected:
    OUTBUF OutBuf;           // index file buffer
    DATABUF DataBuf;         // Data file buffer
    DIRNAME DirName;         // Directory buffer
    File TempIndex;          // File Objects...
    File TempData;
    File IndexFile;
    File DataFile;
    .
    .
};

```

Figure 8: The Dupes class has data members that are buffers for SHOWDUPE's files, objects derived from the File class to manage the files, and member functions to make it all work.

```
Settings.SetName("SHOWDUPE.INI");
```

```

MODE=-1
DESKTOP=31
SCREEN=116

```

You then add any user-modifiable settings to it, for example

```

Settings.AddLine("DESKTOP",
SCR_DEFAULT_DESKTOPCOLORS);
Settings.AddLine("SCREEN",
SCR_DEFAULT_COLORS);
Settings.AddLine("MODE",
VIDMODE_DEFAULT);

```

where the first parameter specifies the "name" portion of a line in the initialization file, and the second parameter is the "value." The second parameter can be either a string, an integer, or a long: The AddLine function has been properly overloaded in the IniFile class definition

```

int AddLine(char *line, char *def);
int AddLine(char *line, int def);
int AddLine(char *line, long def);

```

When you're ready, you can tell the IniFile object to read the initialization file:

```
Settings.Read();
```

You then retrieve the updated settings via

```

char temp1[16], temp2[16], temp3[16],
temp4[16];
.
.
Settings.GetLine("DESKTOP", temp1);
Settings.GetLine("SCREEN", temp2);
Settings.GetLine("MODE", temp3);

```

Based on this example, the SHOWDUPE.INI file might read:

(The actual settings used by SHOWDUPE are described in the sidebar in the Utilities column.)

The IniFile class hides all the details of reading and parsing the initialization file, and it retrieves the values it finds there. As an added feature, it automatically uses the path to the program name

(stored in argv[0]) and looks for the initialization file in the same directory.

While I've found all the classes in SHOWDUPE useful, this is the one that "hit my switch" the most. I'm looking forward to using it again.

APPLICATION-LEVEL CLASSES

It is only when you look at the four application-level classes that you're really seeing SHOWDUPE itself: The other classes are designed for reuse in a variety of other applications.

The primary SHOWDUPE class is ChkDupe. Although this class is derived from StandardApplication (described earlier), it includes objects or pointers to objects in several of the other classes. ChkDupe's responsibility is to run the application: To search the disk(s) for files, eliminate the solitary files, assemble the duplicates, display them on-screen, and let the user View, Tag, or Delete them.

To accomplish its various tasks, ChkDupe uses three other classes: FindDupe finds the duplicate files and assembles the DUPES.IDX and DUPES.DAT tables; MyScroller manages the list box that displays the duplicate filenames and displays their pathnames in the Path window;

THE BUFFER AND BUFMRGR CLASSES

```

class Buffer
{
public:
    BYTE    attribute;
    long    recno;
    char    *buffer;

    Buffer(int size);
    char *Init(int size);
    ~Buffer(void);
    char *operator*(Buffer b) { return b.buffer; }
    char *operator+(Buffer b) { return b.buffer; }
};

class BufMgr
{
    Buffer **Buffers;
    int    numbufs;
    int    bufsize;

public:
    BufMgr(void);
    int Init(int numbuffers, int bufsize);
    Buffer *operator[](int index)
    {
        if(index >= 0 && index < numbufs)
            return (Buffer *)Buffers[index];
        return (Buffer *)NULL;
    }
    ~BufMgr(void);
    int NumBufs(void) { return numbufs; }
    int BufSize(void) { return bufsize; }
};

```

Figure 9: The Buffer class is designed to allocate and manipulate a memory buffer. The BufMgr class can create a series of Buffer objects and access them as if they were an array, via the overloading of the array operator, [].

OVERLOADING THE ARRAY OPERATOR

```
int numbuffers, bufsize;
BufMgr bufMgr;

.
.
.

bufMgr.Init(numbuffers, bufsize);

.
.
.

for(int i = 0; i < bufMgr.NumBufs(); i++)
    printf("%s\n", bufMgr[i].buffer);
```

Figure 10: Since the BufMgr class overloads the C++ array operator, [], you can treat a BufMgr object as if it were an array of structures and access the members of each buffer object.

and Dupes is used by the FindDupe and MyScroll classes. It's worth looking at each of these classes in turn to see how they contribute to SHOWDUPE.

FindDupe is one of two workhorse classes. Most of its work is accomplished by its member function, FindDuplicates, which searches the disk for duplicates and assembles the duplicate file tables. Since FindDupe is derived from RecursiveFileFind, it can make short work of the process of finding the duplicate files. To create the tables, FindDupe uses a class I've not yet discussed: Dupes.

Dupes is the third application class used by ChkDupe. While ChkDupe doesn't use it directly, FindDupe and MyScroller use it to manage all file I/O. Dupes includes four File objects (two for the duplicate tables and two for temporary files) and three buffers used for file I/O. The buffers are customized to fit the size and shape of records in the two duplicate tables. All these items are created as protected variables in the Dupes class definition, which is shown in Figure 8.

Dupes also provides File-based func-

SCROLLER'S VIRTUAL FUNCTIONS

```
char *GetBuffer(int bufnum)
{
    return bufMgr[bufnum]->buffer;
}

BYTE GetAttribute(int bufnum)
{
    return bufMgr[bufnum]->attribute;
}
```

Figure 11: The versions of GetBuffer and GetAttribute in MyScroller implement the pure virtual functions declared in the Scroller class.

tions for reading, writing, and updating files. These functions do more than make it possible to access the File objects with ease. They also implement a storage scheme in which however many file entries are associated with a directory, each full directory path is stored only once in DUPES.DAT. This keeps DUPES.DAT small and easy to get around in.

MyScroller is the other workhorse class used by ChkDupe. If ChkDupe is the application class that pulls the program together, it is MyScroller that does all the work of displaying and deleting duplicate files. Derived from Scroller and Dupes, MyScroller implements a buffer system and a buffer manager for storing the text displayed in the SHOWDUPE list box. It also implements some of the SHOWDUPE chores, such as deleting duplicate files.

MyScroller employs two short, intermediate classes, Buffer and BufMgr, to implement its buffering system. These are shown in Figure 9. Buffer is a class that creates a set of buffers for storing the text of each line in the scroller, its associated color attribute, and the record number of that item's record in the index file.

BufMgr manages the buffers, and it is via BufMgr that MyScroller accesses and changes them. BufMgr contains a pointer to an array of buffers, which allows it to allocate dynamically the number of buffers needed and to access them as an array. It also uses C++ operator overloading to simplify access to the buffers. Figure 10 shows the way in which the BufMgr class overloads [], the array operator, so that MyScroller (or any class that uses BufMgr) can access the buffers.

The result is that you can access any of the buffers owned by a BufMgr object by treating the BufMgr variable either as an array or as an array pointer. This is yet another convenient feature of C++. MyScroller uses this approach to implement the pure virtual functions it inherits from Scroller. The functions shown in Figure 11 exemplify the approach.

MyScroller creates a set of twice as many buffers as are required by the number of lines in Scroller. This allows a minor amount of disk buffering (to improve performance), because only every other PgDn or PgUp (or two screens' worth of Up or Down) will require a disk hit. My-

Scroller must keep track of the first and last disk rows in the buffers, and must also occasionally adjust the buffer tracking variables it inherits from Scroller. MyScroller is multiply derived (from Scroller and Dupes) so it reads disk records and formats them for display in the list box.

MyScroller also tracks which list box row is highlighted and which rows are tagged for deletion. It changes the attribute byte in the index record for the tagged item. Thus, the value of this field determines what rows are highlighted when you navigate the duplicate file list, or exit SHOWDUPE and re-enter it.

Finally, MyScroller maintains a buffer that contains the full pathname to each file whose name is in one of the memory buffers. Because DOS directory names can be 68 characters long (including drive, :, and terminating NULL), and because there can be up to 78 buffers (if SHOWDUPE is being used in 50-line VGA mode), the buffer takes up 5.3K. This buffer is stored in far memory, outside the program's data space.

MyScroller uses the DispPath member function to retrieve each filename when it's needed, displaying it in the Path window. The window is created and supplied by ChkDupe; a pointer to it is passed as a parameter to MyScroller's constructor. I considered having MyScroller create this window itself, but decided that I wanted to retain the control over this window in ChkDupe.

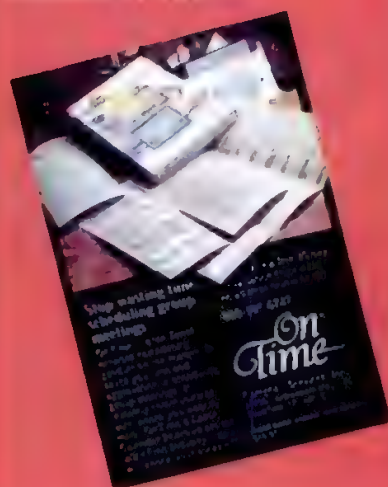
REUSABILITY REVISITED

As you can see, SHOWDUPE's object-oriented architecture takes advantage of most of the features of C++: encapsulation, inheritance and multiple inheritance, polymorphism (via virtual and pure virtual functions), and operator and function overloading. All these features together add up to enormous convenience: They made SHOWDUPE—and a few other applications I've built with them—easier to create. Of SHOWDUPE's 20 object classes, only 4 are application-specific. The remainder can easily be used in other applications. (Indeed, I have plans to use them in some new utilities.) So perhaps the biggest long-term payoff from creating SHOWDUPE will be in the reusability of its code modules. And hopefully, you'll find you can use some of them in your own programs, as well. ■

Richard Hale Shaw is a contributing editor of PC Magazine.

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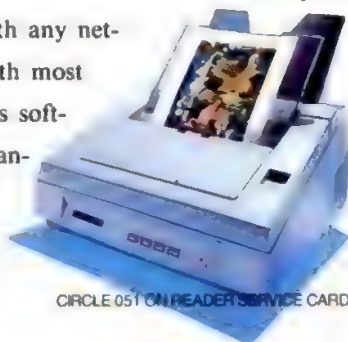
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CIRCLE 051 ON READER SERVICE CARD

by
Charles Petzold

Environments

For many years—at least as far back as Pythagoras—people have attempted to analyze musical tones. This seems simple at first, but it quickly gets very complex. Musical tones (except for some percussive sounds) have a particular pitch or frequency, ranging across the spectrum of human perception from 20 Hz to 20,000 Hz. The notes of a piano, for instance, have a frequency range between 27.5 Hz and 4,186 Hz.

Musical tones are also characterized by volume or loudness. This corresponds to the overall amplitude of the waveform producing the tone. Differences in loudness are measured in decibels. So far, so good.

Then there is this unwieldy thing called *timbre*. Very simply, timbre is that quality of sound that makes it possible for us to distinguish between a piano, a violin, and a trumpet playing the same pitch at the same volume.

UNDERSTANDING TIMBRE

The French mathematician Fourier (1768–1830) discovered that any periodic waveform—no matter how complex—can be represented by a sum of sine waves whose frequencies are integral multiples of a fundamental frequency. The fundamental (also called the first harmonic) is the frequency of periodicity of the waveform. The first overtone (also called the second harmonic) has a frequency twice the fundamental; the second overtone (or third harmonic) has a frequency three times the fundamental, and so forth. The relative amplitudes of the harmonics govern the shape of the waveform.

For example, a square wave can be represented as a sum of sine waves where the amplitudes of the even harmonics (2, 4, 6 . . .) are zero and the amplitudes of the odd harmonics (1, 3, 5 . . .) are in the proportions 1, $\frac{1}{3}$, $\frac{1}{5}$, and so forth. In a sawtooth wave, all harmonics are present and the amplitudes are in the proportions 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and so on.

To the German scientist Hermann

Experimenting with Additive Synthesis in Multimedia Windows

■ This technique, in which musical tones are broken down, analyzed, and regenerated digitally, gives sounds a richness not possible with analog methods, as the program presented here demonstrates.

Helmholtz (1821–1894), this was the key in understanding timbre. In his classic book *On the Sensations of Tone* (1885, republished by Dover Press in 1954) Helmholtz posited that the ear and brain break down complex tones into their component sine waves, and that the relative intensities of these sine waves is what we perceive as timbre. As we shall see, it's not quite this simple.

SUBTRACTIVE SYNTHESIS

Electronic music synthesizers came to widespread public attention in 1968 with the release of Wendy Carlos's *Switched on Bach*. The synthesizers available at that time (like the Moog) were analog synthesizers; they used analog circuitry to generate various audio waveforms such as square waves, triangle waves, and sawtooth waves.

To make these waveforms sound more like real musical instruments, they are subjected to some changes over the course of a single note. The overall amplitude of the waveform is shaped by an *envelope*.

When a note begins, the amplitude begins at zero and rises, usually very quickly. This is known as the *attack*. The amplitude remains constant as the note is held, and this is known as the *sustain*. The amplitude then falls to zero when the note ends; this is known as the *release*.

The waveforms are also put through filters that attenuate some of the harmonics and turn the simple waveforms into something more complex and musically interesting. The cut-off frequencies of these filters can be controlled by an envelope so that the harmonic content of the note changes over the course of the note.

Because these synthesizers begin with harmonically rich waveforms, and some of the harmonics are attenuated with filters, this form of synthesis is known as *subtractive synthesis*.

THE DREAM OF ADDITIVE SYNTHESIS

Even while working with subtractive synthesis, many people involved in electronic music saw additive synthesis as the next big thing.

In additive synthesis you begin with a number of sine wave generators tuned in integral multiples so that each sine wave corresponds to a particular harmonic. The amplitude of each harmonic can be controlled independently by an envelope. Additive synthesis is not very practical using analog circuitry because you'd need somewhere between 8 and 24 sine wave generators for just a single note, and the relative frequencies of these sine wave generators would have to track each other precisely. In addition, analog waveform generators are notoriously unstable and

middle C. Twenty partials are used for the violin, 21 for the oboe and clarinet, and 12 for the trumpet.

When I recently dragged these old issues out of my closet to look at the articles, I was thrilled to find a listing of numerical line-segment approximations for the various frequency and amplitude envelopes for the oboe, clarinet, and trumpet (in Volume II, Number 2, the September 1978 issue).

So, with the Multimedia Extensions to Windows, it became a fairly simple matter to type these numbers into a program, generate multiple sine wave samples for each partial, add them up, and then send the samples out to the waveform audio sound board. And that's exactly what I did in a program called ADDSYNTH (additive synthesis).

FORGET ABOUT REAL TIME

If this stuff excites you, you're probably already thinking about turning your Multimedia PC into a complete additive synthesizer, perhaps with CD-quality sound using a sample rate of 44.1 kHz and 16 bits per sample.

Unfortunately, additive synthesis is extremely difficult to do in real time on a computer. For CD-quality additive synthesis, you need to calculate 44,100 samples per second, or one sample every 22.7 microseconds. Let's assume you want 16 instruments playing together. In that case, a sample for each instrument must be calculated in 1.42 microseconds. Let's also assume that every instrument note requires 16 partials. This means that a sample for each partial for each instrument must be calculated in 89 nanoseconds. This calculation involves getting a sine value (which could be obtained from a lookup table), multiplying

ADDSYNTH.MSC **COMPLETE LISTING**

```

#-----
# ADDSYNTH.MSC make file for Microsoft C 6.0
#-----

addsynth.exe : addsynth.obj addsynth.def addsynth.res
link addsynth,, NUL, /nod slibcw libw win87em mmsystem, addsynth
rc -t addsynth.res

addsynth.obj : addsynth.c addsynth.h instdefs.h
cl -c -G2sw -Ow -W3 -Zp addsynth.c

addsynth.res : addsynth.rc addsynth.h
rc -r addsynth.rc
  
```

Figure 1: This is a Make file for the Microsoft C 6.0 Compiler and the Windows Software Development Kit (SDK).

are prone to frequency drift.

But for digital synthesizers (which can generate waveforms digitally using lookup tables) and computer-generated waveforms, frequency drift isn't a problem, and additive synthesis becomes feasible. Here's the general idea: You record a real musical tone and break it down into harmonics using Fourier analysis. You then determine the relative strength of each harmonic and regenerate the sound digitally using multiple sine waves.

THE COMPLEXITY OF MUSICAL TONES

When people began experimenting with applying Fourier analysis on real musical tones and generating these tones from multiple sine waves, they discovered that timbre is not quite as simple as Helmholtz believed.

The first problem is that the waveforms of real musical tones are not periodic, which means that the harmonic content changes over the course of the note. Moreover, the harmonics are not in strict integral relationships. Indeed, the term *harmonic* is not even appropriate for real musical tones. The various sine wave components are inharmonic and more correctly are called *partials*.

It was discovered that the inharmonicity among the partials of real musical tones is vital in making the tone sound "real"; strict harmonicity yields an "electronic" sound. Each partial changes in both frequency and amplitude over the course of a single note. The relative frequency and amplitude relationships among the partials is different for different pitches and intensities from the same instrument.

The most complex part of a real musical tone occurs during the attack portion of the note, when there is very much inhar-

monic. It was discovered that this complex attack portion of the note was vital in the human perception of timbre.

In short, the sound of real musical instruments is much more complex than anyone quite imagined. The idea of analyzing musical tones and coming up with a relatively few simple envelopes for controlling the various amplitudes and frequencies of the partials was clearly not practical.

REAL SOUNDS ANALYZED

One of the first published analyses of real musical sounds appeared in early issues (1977 and 1978) of the *Computer Music Journal* (at the time published by People's Computer Co., now published by the MIT Press). The three-part series "Lexicon of Analyzed Tones" was written by James A. Moorer, John Grey, and John Strawn, and showed amplitude and frequency graphs of partials of a single note (less than half a second long) played on a violin, oboe, clarinet, and trumpet. The note they used in their study was E flat above

ADDSYNTH.BCP **COMPLETE LISTING**

```

#-----
# ADDSYNTH.BCP make file for Borland C++ 2.0
#-----

addsynth.exe : addsynth.obj addsynth.def addsynth.res
tlink /c /n /Tw /Lc:\borlandc\lib c\sws addsynth, addsynth, NUL, \
/nod cwins cs import maths mmsystem, addsynth
rc -t addsynth.res

addsynth.obj : addsynth.c addsynth.h instdefs.h
bcc -c -w-par -W -2 addsynth.c

addsynth.res : addsynth.rc addsynth.h
rc -r -ic:\borlandc\include addsynth.rc
  
```

Figure 2: Use this Make file with the Borland C++ 2.0 Compiler.



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ADDSYNTH.C

```

// Sound Generation
// Charles Petzold, 1992
ADDSYNTH.C

#include <windows.h>
#include <mmystem.h>
#include <math.h>
#include <stdio.h>
#include <sys/types.h>
#include <sys/stat.h>
#include "addsynth.h"

#define ID_TIMER 1
#define SAMPLE_RATE 22050
#define MAX_PARTIAL 21
#define PI 3.14159

BOOL FAR PASCAL InitProc (HWND, WORD, WORD, LONG);

static char szAppName[] = "Addsynth";

// Structures for storing instrument envelopes
typedef struct
{
    int iTime;
    int iValue;
} ENV;

typedef struct
{
    int iNumAmp;
    ENV *pEnvAmp;
    int iNumFrq;
    ENV *pEnvFrq;
} PRT;

typedef struct
{
    int iSecTime;
    int iNumPartials;
    PRT *pprt;
} INS;

#include "instdefs.h"

// Sine Wave Generator
double SineGenerator (double dFreq, double *pdAngle)
{
    double dAmp;
    dAmp = sin (*pdAngle);
    *pdAngle += 2 * PI * dFreq / SAMPLE_RATE;
    if (*pdAngle >= 2 * PI)
        *pdAngle -= 2 * PI;
    return dAmp;
}

// Fill a Buffer with Composite Waveform
VOID FillBuffer (INS ins, BYTE pBuffer, long lNumSamples)
{
    static double dAngle [MAX_PARTIALS];
    double dAmp, dFrq, dComp, dFrac;
    int i, iPrt, iSecTime, iCompMaxAmp, iMaxAmp;
    long lAmp;

    // Calculate the composite maximum amplitude
    iCompMaxAmp = 0;
    for (iPrt = 0; iPrt < ins.iNumPartials; iPrt++)
    {
        iMaxAmp = 0;
        for (i = 0; i < ins.pprt[iPrt].iNumAmp; i++)
            iMaxAmp = max (iMaxAmp, ins.pprt[iPrt].pEnvAmp[i].iValue);
        iCompMaxAmp += iMaxAmp;
    }

    // Loop through each sample
    for (lAmp = 0; lAmp < lNumSamples; lAmp++)
    {
        dComp = 0;
        iSecTime = (int) (1000 * lAmp / SAMPLE_RATE);
        // Loop through each partial
        for (iPrt = 0; iPrt < ins.iNumPartials; iPrt++)
        {
            dAmp = 0;
            dFrq = 0;
            for (i = 0; i < ins.pprt[iPrt].iNumAmp; i++)
            {
                if (iSecTime >= ins.pprt[iPrt].pEnvAmp[i].iTime &&
                    iSecTime <= ins.pprt[iPrt].pEnvAmp[i+1].iTime)
                {
                    dFrac = (double) (iSecTime -
                        ins.pprt[iPrt].pEnvAmp[i].iTime) /
                        (ins.pprt[iPrt].pEnvAmp[i+1].iTime -
                            ins.pprt[iPrt].pEnvAmp[i].iTime);
                    dAmp += dFrac * ins.pprt[iPrt].pEnvAmp[i+1].iValue +
                        (1-dFrac) * ins.pprt[iPrt].pEnvAmp[i].iValue;
                    break;
                }
            }
            dComp += dAmp * SineGenerator (dFrq, dAngle + iPrt);
        }
        pBuffer[lAmp] = (BYTE) (127 + 127 * dComp / iCompMaxAmp);
    }
}

BOOL CreateFile (INS ins, char *szFileName)
{
    FILE *pFile;
    int iWrite;
    LOCALHANDLE hLocal;
    long lChunkSize, lPcmSize, lNumSamples;
    BYTE pBuffer;
    PCMwaveformat pcm;

    if (NULL == (pFile = fopen (szFileName, "wb")))
        return FALSE;

    lNumSamples = ((long) ins.iSecTime * SAMPLE_RATE / 1000 + 1) / 2 * 2;
    lPcmSize = sizeof (PCMwaveformat);
    lChunkSize = 12 + lPcmSize + 8 + lNumSamples;

    if (NULL == (hLocal = LocalAlloc (LHND, (int) lNumSamples)))
    {
        fclose (pFile);
        return FALSE;
    }

    pBuffer = LocalLock (hLocal);
    FillBuffer (ins, pBuffer, lNumSamples);
    pcm.wFormatTag = WAVE_FORMAT_PCM;
    pcm.wChannels = 1;
    pcm.wSamplesPerSec = SAMPLE_RATE;
    pcm.wAvgBytesPerSec = SAMPLE_RATE;
    pcm.wBlockAlign = 1;
    pcm.wBitsPerSample = 8;

    fwrite ("RIFF", 4, 1, pFile);
    fwrite (&lChunkSize, 4, 1, pFile);
    fwrite ("WAVEfmt", 8, 1, pFile);
    fwrite (&lPcmSize, 4, 1, pFile);
    fwrite (&lPcmSize, 4, 1, pFile);
    fwrite (&lPcmSize, 4, 1, pFile);
    fwrite ("data", 4, 1, pFile);
    fwrite (&lNumSamples, 4, 1, pFile);

    iWrite = fwrite (pBuffer, (int) lNumSamples, 1, pFile);
    fclose (pFile);
    LocalUnlock (hLocal);
    LocalFree (hLocal);

    if (iWrite != 1)
    {
        remove (szFileName);
        return FALSE;
    }

    return TRUE;
}

VOID TestAndCreateFile (HWND hwnd, INS ins, char *szFileName, int idButton)
{
    char szMessage [64];
    struct stat st;

    if (0 == stat (szFileName, &st))
        EnableWindow (GetDlgItem (hwnd, idButton), TRUE);
    else
    {
        if (CreateFile (ins, szFileName))
            EnableWindow (GetDlgItem (hwnd, idButton), TRUE);
        else
        {
            wsprintf (szMessage, "Could not create %s.", szFileName);
            MessageBeep (MB_ICONEXCLAMATION);
            MessageBox (hwnd, szMessage, szAppName,
                MB_OK | MB_ICONEXCLAMATION);
        }
    }
}

```

Figure 3: This listing contains all the C source code for the ADDSYNTH program

ADDSYNTH.C

```
int PASCAL WinMain (HANDLE hInstance, HANDLE hPreInstance,
    LPSTR lpszCmdLine, int nCmdShow)
{
    FARPROC lpDlgProc ;

    lpDlgProc = MakeProcInstance (DlgProc, hInstance) ;
    DialogBox (hInstance, szAppName, NULL, lpDlgProc) ;
    FreeProcInstance (lpDlgProc) ;

    return 0 ;
}

BOOL FAR PASCAL DlgProc (HWND hwnd, WORD message, WORD wParam, LONG lParam)
{
    static char *szTrump = "Trumpet.Wav" ;
    static char *szOboe = "Oboe.Wav" ;
    static char *szClar = "Clarinet.Wav" ;

    switch (message)
    {
        case WM_INITDIALOG:
            SetTimer (hwnd, ID_TIMER, 1, NULL) ;
            return TRUE ;

        case WM_TIMER:
            KillTimer (hwnd, ID_TIMER) ;
            SetCursor (LoadCursor (NULL, IDC_WAIT)) ;
            ShowCursor (TRUE) ;

            TestAndCreateFile (hwnd, instTrump, szTrump, ID_TRUMPET) ;
            TestAndCreateFile (hwnd, instOboe, szOboe, ID_OBOE) ;
            TestAndCreateFile (hwnd, instClar, szClar, ID_CLARINET) ;

            SetDlgItemText (hwnd, ID_TEXT, " ") ;
            SetFocus (GetDlgItem (hwnd, ID_TRUMPET)) ;
    }
}
```

```
showCursor (FALSE) ;
SetCursor (LoadCursor (NULL, IDC_ARROW)) ;
return TRUE ;

case WM_COMMAND:
    switch (wParam)
    {
        case ID_TRUMPET:
            sndPlaySound (szTrump, SND_SYNC) ;
            return TRUE ;

        case ID_OBOE:
            sndPlaySound (szOboe, SND_SYNC) ;
            return TRUE ;

        case ID_CLARINET:
            sndPlaySound (szClar, SND_SYNC) ;
            return TRUE ;
    }
    break ;

case WM_SYSCOMMAND:
    switch (wParam)
    {
        case SC_CLOSE:
            EndDialog (hwnd, 0) ;
            return TRUE ;
    }
    break ;

return FALSE ;
}
```

2 OF 2

ADDSYNTH.RC

COMPLETE LISTING

```
/*-----
ADDSYNTH.RC resource script
-----*/

#include <windows.h>
#include "addsynth.h"

AddSynth DIALOG 32768, 0, 176, 48
STYLE WS_OVERLAPPED | WS_CAPTION | WS_SYSMENU | WS_MINIMIZEBOX
CAPTION "Additive Synthesis"
{
    PUSHBUTTON "Trumpet" ID_TRUMPET, 8, 8, 48, 16, WS_DISABLED
    PUSHBUTTON "Oboe" ID_OBOE, 64, 8, 48, 16, WS_DISABLED
    PUSHBUTTON "Clarinet" ID_CLARINET, 128, 8, 48, 16, WS_DISABLED
    LTEXT "Preparing Data..." ID_TEXT, 8, 32, 100, 8
}
```



Figure 4: This resource script contains the definition of the program's window.

it by an envelope amplitude, accumulating the samples additively, and adjusting the envelope and frequency amplitudes for the next sample. Once you realize that the microprocessor clock cycle for a 33-MHz machine is 30 nanoseconds, you see clearly that the job is impossible.

So, even though my ADDSYNTH program is limited to playing just a single trumpet, oboe, or clarinet note at a 22.05-kHz sample rate with 8 bits per sample, I decided to write the calculated samples to a .WAV waveform file (the format of which I discussed in the last installment of this column) and then play the file using the sndPlaySound function (also discussed in the last issue).

THE ADDSYNTH PROGRAM

The ADDSYNTH program is shown in Figures 1 through 6. An additional file

called INSTDEFS.H (instrument definitions) is not shown here because it consists of several hundred lines of pretty boring numbers. You'll have to download INSTDEFS.H from PC MagNet. You can download the other source code files and ADDSYNTH.EXE as well. If you want to re-create the executable using the Microsoft C 6.0 Compiler and the Windows Software Development Kit (SDK), you can execute

NMAKE ADDSYNTH.MSC

If you're using the Borland C++ 2.0 Compiler, execute the command

MAKE -fADDSYNTH.BCP

In either case, you must also have the Multimedia Development Kit (MDK) in-

stalled. If you're using the Borland compiler, the MDK should be installed in the same directories as the compiler.

ADDSYNTH has three push buttons labeled Trumpet, Oboe, and Clarinet. The first time you run ADDSYNTH, these buttons will be disabled until the program creates the TRUMPET.WAV, OBOE.WAV, and CLARINET.WAV sound files. The push buttons are then enabled and you can play the three sounds. The next time you run the program, it will check for the existence of the waveform files and doesn't need to re-create them.

THE ENVELOPE DATA

Near the beginning of ADDSYNTH.C, I define three structures used for storing the envelope data in the INSTDEFS.H header file. Each amplitude and frequency envelope is stored as an array of structures of type ENV. These are number pairs that consist of a time in milliseconds followed by an amplitude value (in an arbitrary scale) or a frequency (in cycles per second). These arrays are of variable length, ranging from 6 to 14 values. Straight lines are assumed to connect the amplitude and frequency values.

Each instrument consists of a collection of partials (12 for the trumpet and 21 for the oboe and clarinet) stored as an array of structures of type PRT. The PRT structure stores the number of points in the amplitude and frequency envelopes and a pointer to the ENV array.

The INS structure contains the total

```

ADDSYNTH.DEF                                     COMPLETE LISTING
;-----
; ADDSYNTH.DEF module definition file
;-----

NAME                ADDSYNTH

DESCRIPTION          'Additive Synthesis Generation (c) Charles Petzold, 1992'
EXETYPE              WINDOWS
STUB                 'WINSTUB.EXE'
CODE                 PRELOAD MOVEABLE DISCARDABLE
DATA                 PRELOAD MOVEABLE MULTIPLE
HEAPSIZE             1024
STACKSIZE            8192
EXPORTS              _DlgProc

```

Figure 5: This is the program's module definition file.

time of the tone in milliseconds, the number of partials, and a pointer to the PRT array that stores the partials.

CREATING THE FILES

When ADDSYNTH starts up, it loads its main window as a dialog box by calling DialogBox during the WinMain function. When the dialog box procedure (DlgProc) processes the WM_INITDIALOG message, it sets a Windows timer and then performs initialization during the WM_TIMER message. (This is to allow the dialog box to be displayed before program initialization.) During the WM_TIMER message, ADDSYNTH calls TestAndCreateFile for the three waveform files. This function tests whether the file exists and, if so, enables the push button for that instrument. If the file does not exist, the function calls CreateFile.

CreateFile creates a waveform file. To get the actual waveform data, CreateFile calls FillBuffer, which is where the real work gets done. FillBuffer begins by calculating the total composite maximum amplitude. It does this by looping through the partials for the instrument, finding the maximum amplitude for each partial, and then adding them all together. This value

is later used to scale the samples to an 8-bit sample size.

FillBuffer then proceeds to calculate a value for each sample. Each sample corresponds to a millisecond time value that depends on the sample rate. (Actually, at a 22.05-kHz sample rate, every 22 samples correspond to the same millisecond time value.) FillBuffer then loops through the partials. For both the frequency and amplitude, it finds the envelope line segment corresponding to the millisecond time value and performs a linear interpolation.

The frequency value is passed to the SineGenerator function, together with a phase angle value. As I discussed several issues ago, digitally generating sine waves requires a phase angle value to be maintained and incremented based on the frequency value. On return from the SineGenerator function, the sine value is multiplied by the amplitude for the partial and accumulated. After all the partials for a sample are added together, the sample is scaled to the size of a byte.

HOW DOES IT SOUND?

Attempting to generate digital reproductions of real-life sounds makes me wish I had something a little better to play them on than my old Sound Blaster board. *PC Magazine* is on the verge of getting some new Multimedia PC hardware in for evaluation, and I'll be interested in trying out this program on other hardware.

But still, the tones sound pretty good. The trumpet sounds like a trumpet, the oboe sounds like an oboe, and the clarinet sounds like a clarinet, and they all seem to have an authentic nonsynthesized sound. The complexity of the waveforms give the sounds a richness just not available with simpler synthesis techniques. ■

```

ADDSYNTH.H                                     COMPLETE LISTING
;-----
; ADDSYNTH.H header file
;-----

#define ID_TRUMPET    10
#define ID_OBOE       11
#define ID_CLARINET   12
#define ID_TEXT       13

```

Figure 6: This header file defines constants used in both the C code and resource script.

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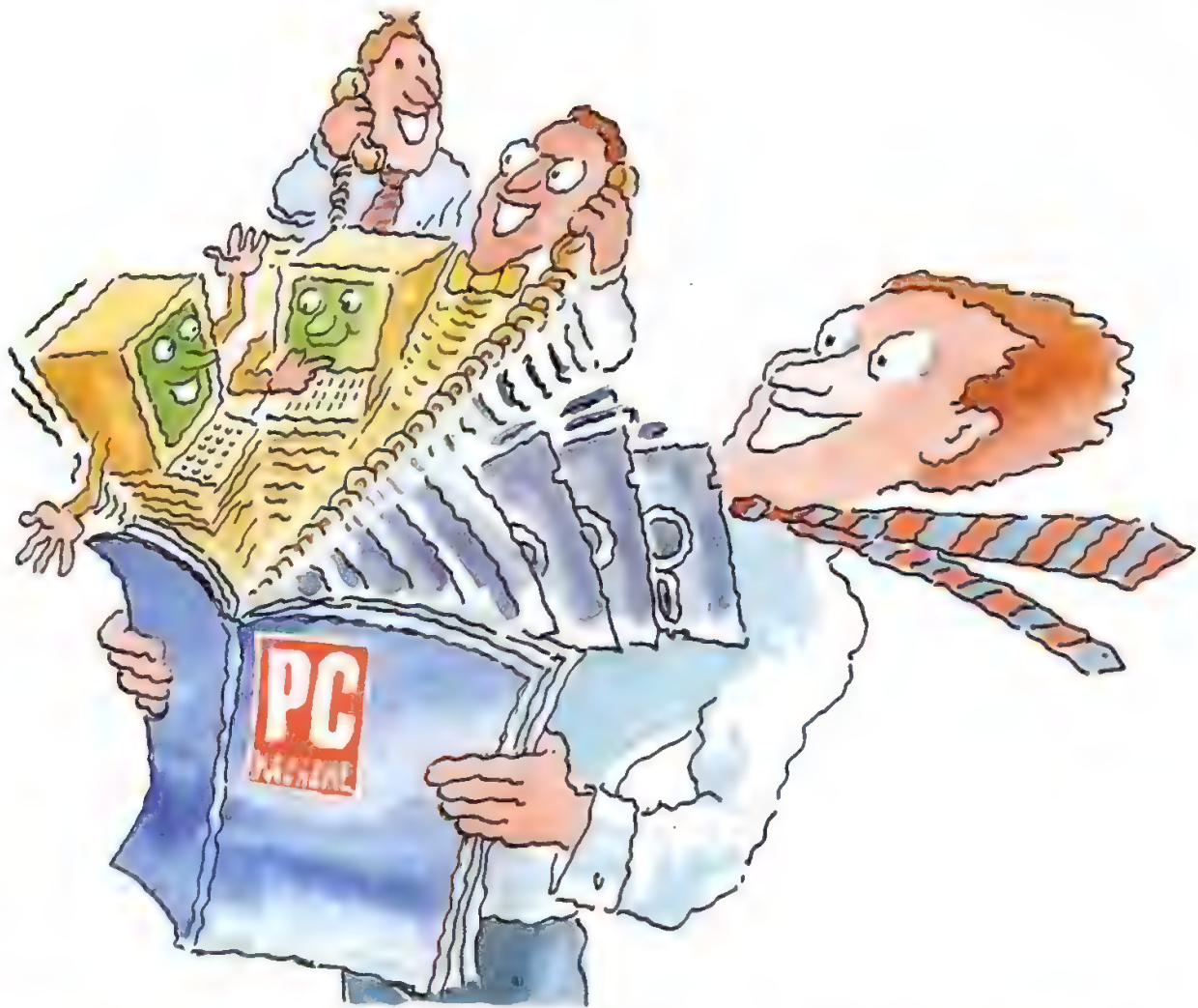


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by
Ray Duncan

Power Programming

Making an Ordinary Windows Application Pen-Aware

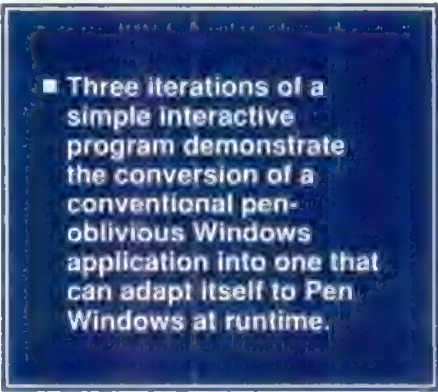
In the last two issues, we talked about the Microsoft Windows for Pen Computing (Pen Windows) user interface, surveyed the different kinds of programs it supports, and summarized some of the pen-oriented additions to the Windows API. In this column, we'll see how a conventional mouse- and keyboard-oriented Windows application is made "pen-aware."

For our test platform, we'll use a simple interactive program called DEMO, which has two menu items and one dialog. The user can choose Edit-Enter to activate the dialog, enter some text, and then click the dialog's OK button to display the text in the DEMO window (see the screen shot in Figure 1). Alternatively, the user can pick File-Exit to terminate the DEMO program. The source code for DEMO is trivial compared with commercial Windows applications, but it illustrates nearly all of the important tasks that a Windows programmer must master: processing window messages, setting up callback routines, decoding menu commands, handling user input via dialogs, and painting in a window. The level of functionality and the amount of source code in DEMO will also provide a useful yardstick when we look at equivalent demonstration programs for other pen-based systems such as PenPoint.

THE DEMO BUILDING BLOCKS

I can't presume to provide you with a detailed explanation of Windows programming here; for a thorough grounding in these concepts, I refer you to the Gold Standard—Charles Petzold's book *Programming Windows*. But I do think it's useful to review the essential elements of a typical Windows program before incorporating any pen-dependent code. And perhaps this will help those of you who have been apprehensive about venturing into Windows programming to see that it's really not so difficult after all; it just requires a different point of view and a lot of patience.

But first, a road map. The listing in



■ Three iterations of a simple interactive program demonstrate the conversion of a conventional pen-oblivious Windows application into one that can adapt itself to Pen Windows at runtime.

Figure 2, DEMO1.C, is the source code for the pen-oblivious version of DEMO. Figure 3, DEMO1.H, is the C language header file for the DEMO program; it defines various constants that are used both by the C compiler and the Resource Compiler. DEMO's module definition file, which is shown in Figure 4, is processed by the Linker and specifies various characteristics of DEMO's executable file. Figure 5, DEMO1.RC, is the resource script for DEMO; the templates in the resource script define the contents and appearance of DEMO's menu bar and dialog box. The resource script is processed by the Resource Compiler and then merged with the executable file produced by the Linker to generate the final Windows application file. The complete source files for all versions of the DEMO program can be downloaded from PC MagNet.

Looking at DEMO1.C, we see that our program contains six distinct functions or procedures: WinMain(), InitApplication(), InitInstance(), MainWndProc(), DoCommand(), and EntryDlgProc(). Based on

your previous C experience with a "magic" function called main(), you might immediately postulate that WinMain() defines the entry point for a Windows application, and you'd be right. But what about those other five functions? Three of them—MainWndProc(), DoCommand(), and EntryDlgProc()—don't seem to be reachable from WinMain() or any of the functions it calls directly. What's going on here?

What's going on is event-driven programming, but let's dispose of WinMain() before worrying about the more mysterious functions. Remember that Windows is a multitasking system, so it's possible that more than one copy (instance) of a particular application can be running at once. Consequently, when WinMain() is entered, Windows passes it an *instance handle* (analogous to a process ID in other systems) and a *previous instance handle*. If the previous instance handle is zero, then the current instance is the only one running, and WinMain() calls InitApplication(), which in turn calls the Windows API function RegisterClass() to register an application-specific window class.

The window class defines some generic attributes for windows that will be created by the application, such as a default window style, a default icon, a default cursor shape, and a default menu bar. Very importantly, it also defines which routine in DEMO will be the "callback function" responsible for handling messages that are directed to windows of that class. We'll return to this concept in a moment.

If the window class is registered suc-

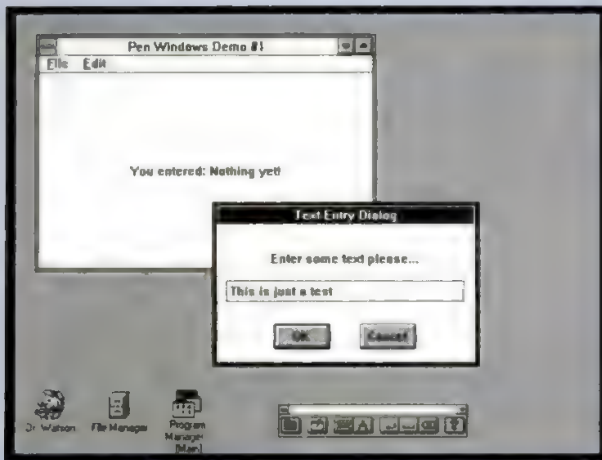


Figure 1: DEMO1.EXE under Windows. This program allows the user to enter text in a dialog box and then displays the text in the main window. The screenshot is in monochrome because it was captured on the Wacom HD-648A integrated VGA display/input tablet.

thick or thin border, presence or absence of the "system menu box," and so on—and menu bar can also be overridden at this point if necessary (DEMO basically uses the defaults for everything to make the source code as simple as possible).

After (possibly) calling `InitApplication()` and then `InitInstance()`, `WinMain()` starts chasing its own tail. It calls the Windows API functions `GetMessage()`, `TranslateMessage()`, and `DispatchMessage()` over and over until the value of `GetMessage()` is zero. This construct is known as the Windows event loop, and it is the heart of every Windows application and the basis of Windows cooperative multitasking. Whenever an event occurs that is of interest to the application, such as a mouse click, a keypress, or a timer expiring, Windows places a packet of information called a message in that application's message queue. The message packet includes the handle of the application window (`hWnd`) that is destined to process the event (since an application can have multiple windows open at once), a message code (`wMsg`), and two other items of information—one single precision (`wParam`) and one double-precision (`lParam`)—which may or may not be of significance depending on the value of

successfully, or the previous instance handle is nonzero, indicating that another instance of the application is already running and has already registered the window class, `WinMain()` calls `InitInstance()`. `InitInstance()` is responsible for creating the instance's main or "frame" window, saving the window's handle, and making the window visible on the screen by calling the

Windows API functions `CreateWindow()`, `ShowWindow()`, and `UpdateWindow()`. Among other things, `InitInstance()` informs Windows what text should appear in the main window's title bar, where the window should be placed, how big it should be, and whether it should initially be displayed maximized, overlapped, or iconized. The class defaults for the window style—

```

DEMO1.C
// DEMO1.C Windows application that demonstrates simple text input
// via a dialog, then displays same text in main window.
// Copyright (C) 1991 Ray Duncan

#include "windows.h"
#include "demo1.h"

HANDLE hInst;           // instance handle
HWND hWnd;             // main window handle

#define INPUTSIZE 80    // max length of input
#define OUTPUTSIZE 256 // max length of output

char buf1[INPUTSIZE];   // user's input buffer
char buf2[OUTPUTSIZE];  // formatted output buffer

// WinMain - entry point from Windows. Registers window class,
// creates main window, processes messages until WM_QUIT received.
//
int PASCAL WinMain(HANDLE hInstance,
                  LPSTR lpCmdLine, int nCmdShow)
{
    MSG msg;

    hInst = hInstance;           // save this instance handle

    strcpy(buf1, "Nothing yet!"); // initialize output text

    if (!hPrevInstance)          // if first instance,
        if (!InitApplication(hInstance)) // register window class
            return (FALSE);      // exit if couldn't register

    if (!InitInstance(hInstance, nCmdShow)) // create this instance's window
        return (FALSE);

    while (GetMessage(&msg, NULL, 0, 0)) // while message != WM_QUIT
    {
        TranslateMessage(&msg); // translate virtual key codes
        DispatchMessage(&msg); // dispatch message to window
    }
    return (msg.wParam);         // return code = WM_QUIT value
}

//
// InitApplication - registers window class for this application
//
BOOL InitApplication(HANDLE hInstance)
{
    WNDCLASS wc;

    wc.style = NULL;           // set class parameters
    wc.lpfnWndProc = MainWndProc; // class callback function
    wc.cbClsExtra = 0;         // extra per-class data
    wc.cbWndExtra = 0;         // extra per-window data
    wc.hInstance = hInstance;  // handle of class owner
    wc.hIcon = LoadIcon(NULL, IDI_APPLICATION); // default icon
    wc.hCursor = LoadCursor(NULL, IDC_ARROW); // default cursor
    wc.hbrBackground = GetStockObject(WHITE_BRUSH); // background color
    wc.lpszMenuName = "DemoMenu"; // name of menu resource
    wc.lpszClassName = "DemoWinClass"; // name of window class

    return (RegisterClass(&wc)); // register class, return flag
}

//
// InitInstance - creates main window for this application instance
//
BOOL InitInstance(HANDLE hInstance, int nCmdShow)
{
    hWnd = CreateWindow( // create frame window
        "DemoWinClass", // window class name
        "Pen Windows Demo #1", // text for title bar
        WS_OVERLAPPEDWINDOW, // window style
        CW_USEDEFAULT, // default horizontal position
        CW_USEDEFAULT, // default vertical position
        CW_USEDEFAULT, // default width
        CW_USEDEFAULT, // default height
        NULL, // no parent window
        NULL, // use class default menu
        hInstance, // window owner
        NULL // unused pointer
    );

    if (!hWnd) return (FALSE); // error, can't create window

    ShowWindow(hWnd, nCmdShow); // make window visible
    UpdateWindow(hWnd); // force WM_PAINT message
    return (TRUE); // return success flag
}

```

Figure 2: This is the source code for the pen-oblivious version of the DEMO program.



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DEMO1.C

2 OF 2

```
//
// MainWndProc - callback function for main application window
//
long FAR PASCAL MainWndProc(HWND hwnd, WORD wmsg, WORD wParam, LONG lParam)
{
    HDC hdc;
    PAINTSTRUCT ps;
    RECT rect;

    switch (wmsg)
    {
        case WM_COMMAND:
            // menu command received,
            DoCommand(hwnd, wParam);
            break;

        case WM_PAINT:
            // window needs repainting
            hdc = BeginPaint(hwnd, &ps);
            GetClientRect(hwnd, &rect);
            wprintf(buf2, "You entered: %s", (LPSTR) buf1);
            DrawText(hdc, buf2, -1, &rect, DT_SINGLELINE | DT_CENTER | DT_VCENTER);
            EndPaint(hwnd, &ps);
            // Release device context
            break;

        case WM_SIZE:
            // window resized
            InvalidateRect(hwnd, NULL, TRUE);
            UpdateWindow(hwnd);
            // force WM_PAINT message
            break;

        case WM_DESTROY:
            // window being destroyed
            PostQuitMessage(0);
            break;

        default:
            // let Windows handle it.
            return(DefWindowProc(hwnd, wmsg, wParam, lParam));
    }

    return(0);
}

//
// DoCommand - handles menu command messages
//
void DoCommand(HWND hwnd, WORD wParam)
{
    FARPROC lpProc;

    // far pointer to callback
    switch(wParam)
    {
        // decode it
        case IDM_EXIT:
            // user picked File-Quit
            SendMessage(hwnd, WM_CLOSE, 0, 0);
            break;

        case IDM_ENTER:
            // user picked Edit-Enter
            lpProc = MakeProcInstance(EntryDlgProc, hwnd);
            DialogBox(hwnd, "TextEntryBox", hwnd, lpProc);
            InvalidateRect(hwnd, NULL, TRUE);
            UpdateWindow(hwnd);
            // force WM_PAINT message
            FreeProcInstance(lpProc);
            break;

        default:
            // unknown command, ignore it
            break;
    }

    //
    // EntryDlgProc - callback function for "Text Entry..." dialog
    //
    BOOL FAR PASCAL EntryDlgProc(HWND hdlg, WORD wmsg, WORD wParam, LONG lParam)
    {
        switch (wmsg)
        {
            case WM_INITDIALOG:
                // dialog box initialization
                return (TRUE);
                // signal message processed

            case WM_COMMAND:
                // command received
                if(wParam == IDOK)
                {
                    // OK button clicked?
                    // yes, retrieve text
                    GetDlgItemText(hdlg, IDD_EDITTEXT, buf1, INPUTSIZE-1);
                    EndDialog(hdlg, TRUE);
                    // signal text accepted
                }
                else if(wParam == IDCANCEL)
                {
                    // Cancel button clicked?
                    strcpy(buf1, "Input was cancelled!");
                    EndDialog(hdlg, FALSE);
                    // signal text not accepted
                }
            }

        return(FALSE);
        // signal message not processed
    }
}
```

wMsg. Incidentally, the centralized event loop gives the application a chance to filter every message directed to that program before the messages are spun off to their respective destinations.

Here's how the event loop works. GetMessage() retrieves a message from the application message queue, and a call to GetMessage() has three possible consequences:

- The message is the special WM_QUIT message, indicating that the application should terminate; in this case the "value" of GetMessage() is FALSE, and WinMain() falls out of the event loop.
- No message is waiting, so the application goes to sleep "within" GetMessage() until a message is ready, and other applications are allowed to run.
- A message that is not WM_QUIT is waiting; in this case the "value" of GetMessage() is TRUE, and the various components of the message are returned to WinMain() in the structure msg. WinMain() calls TranslateMessage(), which implements keyboard accelerators, then calls DispatchMessage() to send the message to the appropriate application window callback function. Aha! Now the issue of those mysterious routines with no visible point of access again arises.

Callback routines are so named because they are entered directly from Windows rather than from another routine in the same application. In this particular situation, WinMain() calls DispatchMessage() to pass a message back to Windows after its translation, and Windows then "calls the application back" to pass the message to the routine that is responsible for the window that should receive the message. The responsible routine is often called the "window's message handler" and it is the callback function that was specified when the window's class was registered—in this case, MainWndProc(). For the convenience of the callback function, Windows breaks the components of the message

into individual parameters on the stack, which can be given descriptive names (hwnd, wMsg, and so on) in the callback function's prototype and then referenced freely within the function.

As it turns out, while the application is running, Windows is constantly bombarding MainWndProc() with zillions (well, maybe dozens) of different messages. Our program doesn't have to process all of the messages, though; it can pick out the ones it needs, and punt the others to a Windows API function called DefWindowProc(). DefWindowProc() takes "reasonable" actions in response to the most important messages and simply consumes the rest. (The source code for

DEMO1.H

COMPLETE LISTING

```
#define IDM_EXIT 100
#define IDM_ENTER 101

#define IDCANCEL 200
#define IDD_EDITTEXT 201

int PASCAL WinMain(HANDLE, HANDLE, LPSTR, int);
BOOL InitApplication(HANDLE);
BOOL InitInstance(HANDLE, int);
long FAR PASCAL MainWndProc(HWND, unsigned, WORD, LONG);
BOOL FAR PASCAL EntryDlgProc(HWND, unsigned, WORD, LONG);
void DoCommand(HWND, WORD);
```

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Figure 3: This is the C language header file for DEMO1.C.

DEMO1.DEF

COMPLETE LISTING



```
; DEMO1.DEF -- Module definition file for DEMO1.C
;
NAME DEMO1
DESCRIPTION 'Demo Program #1'
EXETYPE WINDOWS
STUB 'WINSTUB.EXE'
CODE PRELOAD MOVEABLE DISCARDABLE
DATA PRELOAD MOVEABLE MULTIPLE
HEAPSIZE 1024
STACKSIZE 8192
EXPORTS
    MainWndProc
    EntryDlgProc
```

Figure 4: This module-definition file defines the program's module name, code and data segment characteristics, stack and heap size, and other information used by the Linker.

DefWindowProc() can be found in several Windows programming books and is also supplied in the documentation for the Microsoft Windows Software Development Kit.) In our DEMO application, for example, we only process four of the many possible messages: WM_PAINT, which tells our application that the contents of the window need to be redrawn, WM_COMMAND, which is received when the user picks something from the menu bar, WM_SIZE, which arrives when the user resizes the window, and WM_DESTROY, which is generated when the user picks "close" from the system menu or (indirectly) when the user picks "Exit" on the File menu.

We won't go into further detail on menus and message processing at this time, except to mention how it happens that DEMO's other callback function gets

control. When MainWndProc() receives a WM_COMMAND message indicating that the user picked Edit-Enter from the menu bar, it calls the Windows API function DialogBox() with the name of a dialog box template (TextEntryBox, in this case) and the address of the callback function that is responsible for that dialog box—EntryDlgProc(). Windows goes to the DEMO1.EXE file, finds the binary representation of the dialog box that was built by the Resource Compiler, brings it into memory, and displays it to the user. TextEntryBox is a "modal" dialog box, so execution of MainWndProc() is suspended while TextEntryBox is active; all input by the user outside the dialog box is ignored, and all user input (keypresses, mouse clicks, and so forth) inside the dialog box is passed in the form of special messages to EntryDlgProc(). When

EntryDlgProc() sees a message that corresponds to the OK or Cancel buttons, it calls the Windows API function EndDialog(), which destroys the dialog box and returns control to MainWndProc(). MainWndProc() then exits to Windows, and Windows returns to the application's WinMain() from the DispatchMessage() function so that the event loop can call GetMessage() again. Dizzying, isn't it?

By the way, you should probably ignore the MakeProcInstance() and FreeProcInstance() Windows API function calls that surround the invocation of DialogBox(). They are related to the obsolescent Win-

When Windows 3.1 is released, software developers will be able to put real-mode considerations behind them forever.

dows Real-mode virtual memory manager, and can be eliminated in applications that will only run in protected mode. When Windows 3.1 is released, software developers will be able to put such Byzantine real-mode considerations behind them forever.

DEMO1.RC

COMPLETE LISTING



```
#include "windows.h"
#include "demo1.h"

DemoMenu MENU
BEGIN
    POPUP "&File"
    BEGIN
        MENUITEM "&Exit", IDM_EXIT
    END
    POPUP "&Edit"
    BEGIN
        MENUITEM "&Enter text...", IDM_ENTER
    END
END

TextEntryBox DIALOG 30, 24, 141, 76
CAPTION "Text Entry Dialog"
STYLE DS_MODALFRAME | WS_POPUP | WS_CAPTION
BEGIN
    CTEXT "Enter some text please...", -1, 29, 15, 82, 8, WS_CHILD | WS_VISIBLE | WS_GROUP
    EDITTEXT IDD_EDITTEXT, 5, 31, 130, 12, ES_LEFT | WS_CHILD | WS_VISIBLE | WS_BORDER | WS_TABSTOP
    DEFUSHBUTTON "OK", IDOK, 31, 55, 31, 14, WS_CHILD | WS_VISIBLE | WS_TABSTOP
    PUSHBUTTON "Cancel", IDCANCEL, 78, 55, 31, 14, WS_CHILD | WS_VISIBLE | WS_TABSTOP
END
```

Figure 5: The resource script for DEMO1.C contains the definitions of the DEMO program's menu and dialog.

DEMO2.C

CODE FRAGMENT

```
// DEMO2.C Minimally pen-aware Windows application that demonstrates
// simple text input or handwritten input via a dialog, then displays
// same text in main window.
// Copyright (C) 1991 Ray Duncan

#define WIN31

#include "windows.h"
#include "penwin.h"
#include "demo2.h"

HANDLE hInst;           // instance handle
HWND hWnd;              // main window handle

HANDLE hPenWin = NULL;  // Pen Windows module handle

#define INPUTSIZE 86    // max length of input
#define OUTPUTSIZE 256  // max length of output

char buf1[INPUTSIZE];   // user's input buffer
char buf2[OUTPUTSIZE];  // formatted output buffer

//
// WinMain - entry point from Windows. Registers window class,
// creates main window, processes messages until WM_QUIT received.
//
int PASCAL WinMain(HANDLE hInstance, LPSTR lpCmdLine, int nCmdShow)
{
    HANDLE hPrevInstance, LPSTR lpCmdLine, int nCmdShow);
}
```

```
{
    MSG msg;

    VOID (FAR PASCAL *RegisterPenApp)(WORD, BOOL) = NULL;

    hInst = hInstance;           // save this instance handle
    strcpy(buf1, "Nothing yet!"); // initialize output text

    if(hPrevInstance)             // if first instance,
        if(!InitApplication(hInstance)) // register window class
            return (FALSE);       // exit if couldn't register

    if(!InitInstance(hInstance, nCmdShow)) // create this instance's window
        return (FALSE);

    if(hPenWin = GetSystemMetrics(SM_PENWINDOWS)) // Pen Windows running?
    {
        // if so, register as Pen app
        if(RegisterPenApp = GetProcAddress(hPenWin, "RegisterPenApp"))
            (*RegisterPenApp)(RPA_DEFAULT, TRUE);
    }

    while(GetMessage(&msg, NULL, 0, 0)) // while message != WM_QUIT
    {
        TranslateMessage(&msg);       // translate virtual key codes
        DispatchMessage(&msg);        // dispatch message to window
    }
    return (msg.wParam);               // return code = WM_QUIT value
}
```

Figure 6: The initial portion of the source file DEMO2.C, showing the only parts of the program that differ from DEMO1.C. This version of DEMO is "pen-aware" in a rudimentary way: It checks to see if Pen Windows is running during its initialization. If pen capabilities are available, DEMO2 calls the Windows API function RegisterPenApp(), which automatically converts all text entry areas (EDIT controls) in the application's dialog boxes into handwriting entry areas (HEDIT controls).

MAKING DEMO PEN-AWARE

Strangely enough, if we run DEMO1.EXE under Pen Windows, it starts to behave rather oddly because Pen Windows is trying to help out. Pen Windows lets you "write" in the text entry field of DEMO1's

dialog box, but it doesn't attempt to translate the characters until you click the OK or Cancel button. It then displays the translated characters and waits until you click the OK or Cancel button again before returning control from the dialog to

MainWndProc(). Our hypothetical end user isn't going to be very happy with this little hiccup in the dialog's responsiveness, so let's see what it takes to turn DEMO1.C into a pen-aware application.

At the most rudimentary level of pen support, this conversion is remarkably easy. Figure 6 shows DEMO2.C's initial declarations and the WinMain() function, the only parts of the program that differ from DEMO1.C. The new version of WinMain() checks to see whether it's running under Pen Windows by calling the Windows API function GetSystemMetrics() with the new parameter SM_PENWINDOWS. If the value of GetSystemMetrics() is nonzero, Pen Windows is running, and the returned value is the "Pen Windows module handle." In this case, DEMO2 immediately uses the module handle in a call to the Windows API function GetProcAddress() to retrieve the address of the Pen Windows API function RegisterPenApp(); this technique is called runtime dynamic linking. (Using runtime dynamic linking instead of the more familiar load-time dynamic linking lets DEMO2 run in environments where the Pen Windows module is not present.)

If the Pen Windows module is found, and RegisterPenApp()'s address can be obtained, WinMain()'s subsequent call to RegisterPenApp() notifies Pen Windows that the application is pen-aware. In response to the call to RegisterPenApp(), Pen Windows automatically converts all

DOCOMMAND() ROUTINE

CODE FRAGMENT

```
//
// DoCommand - handles menu command messages. In the case of an
// IDM_ENTER message, uses the dialog TextEntryBox1 if ordinary
// Windows is running, or TextEntryBox2 if Pen Windows is present.
//
void DoCommand(HWND hWnd, WORD wParam)
{
    FARPROC lpProc;           // far pointer to callback
    LPSTR lpszDialogName;     // far pointer to dialog name

    // select appropriate dialog
    lpszDialogName = hPenWin ? "TextEntryBox2" : "TextEntryBox1";

    switch(wParam)             // decode it
    {
        case IDM_EXIT:         // user picked File-Quit
            SendMessage(hWnd, WM_CLOSE, 0, 0);
            break;

        case IDM_ENTER:        // user picked Edit-Enter
            lpProc = MakeProcInstance(EntryDlgProc, hInst);
            DialogBox(hInst, lpszDialogName, hWnd, lpProc);
            InvalidateRect(hWnd, NULL, TRUE); // repaint everything
            UpdateWindow(hWnd); // force WM_PAINT message
            FreeProcInstance(lpProc);
            break;

        default:                // unknown command, ignore it
            break;
    }
}
```

Figure 7: The DoCommand() routine from DEMO3.C selects alternative dialog box templates, depending on whether Pen Windows is running. See Figure 8.

DEMO3'S TWO DIALOG TEMPLATES

```
TextEntryBox1 DIALOG 38, 24, 141, 76
CAPTION "Text Entry Dialog"
STYLE DS_MODALFRAME | WS_POPUP | WS_CAPTION
BEGIN
    CTEXT "Enter some text please...", -1, 29, 15, 82, 8, WS_CHILD | WS_VISIBLE | WS_GROUP
    EDITTEXT IDD_EDITTEXT, 5, 31, 138, 12, ES_LEFT | WS_CHILD | WS_VISIBLE | WS_BORDER | WS_TABSTOP
    DEFPUSHBUTTON "OK", IDOK, 31, 55, 31, 14, WS_CHILD | WS_VISIBLE | WS_TABSTOP
    PUSHBUTTON "Cancel", IDCANCEL, 78, 55, 31, 14, WS_CHILD | WS_VISIBLE | WS_TABSTOP
END

TextEntryBox2 DIALOG 38, 24, 141, 76
CAPTION "Text Entry Dialog"
STYLE DS_MODALFRAME | WS_POPUP | WS_CAPTION
BEGIN
    CTEXT "Enter some text please...", -1, 29, 15, 82, 8, WS_CHILD | WS_VISIBLE | WS_GROUP
    CONTROL " ", IDD_EDITTEXT, "bedit", ES_LEFT | WS_CHILD | WS_VISIBLE | WS_BORDER | WS_TABSTOP, 5, 29, 138, 16
    DEFPUSHBUTTON "OK", IDOK, 31, 55, 31, 14, WS_CHILD | WS_VISIBLE | WS_TABSTOP
    PUSHBUTTON "Cancel", IDCANCEL, 78, 55, 31, 14, WS_CHILD | WS_VISIBLE | WS_TABSTOP
END
```

Figure 8: If Pen Windows is running, DEMO3 uses a dialog box template containing a BEDIT control; otherwise it uses a different template containing an ordinary EDIT control.

text entry areas (EDIT controls) in the application's dialog boxes into handwriting entry areas (HEDIT controls). Pen Windows will simply funnel keyboard entries within HEDIT controls to the application in the normal fashion, but it will transparently convert handwriting within HEDIT controls into characters and then pass them to the application as though they had been entered at the keyboard. We've now got a program that adapts itself to the environment! If running under plain-vanilla Windows, DEMO2 has exactly the same look and feel as DEMO1. However, if DEMO2 is running under Pen Windows, the user has the option of either typing or writing the characters in the dialog box.

But we can take one more step to improve DEMO's pen-awareness. If you

use a program with HEDIT controls in its dialogs for a while, you'll soon find that HEDIT controls are not a very com-

BEDIT controls have a
handwriting "comb"
that simplifies the
entry of characters.

fortable solution to handwritten data entry. There aren't enough visual clues; all you get is an inscrutable box that you're expected to write in, without any indica-

tion of how many characters will fit in the box or how big they should be. You can make the user's job easier by substituting a BEDIT control for the HEDIT control when the application is running under Pen Windows.

As you'll recall from our discussion in the last issue, a BEDIT control is a special Pen Windows feature that displays a "comb" within an editing area. The divisions that are provided by the comb help the user space his characters in an optimal fashion, provide guidance about how many characters are expected, and improve the recognition rate.

The neatest way to incorporate BEDIT controls into a pen-aware application is to have alternative dialog templates—one for ordinary Windows that uses standard EDIT controls, and one for Pen Windows that uses BEDIT controls instead. At the application's runtime, it can select one dialog or the other based on the presence or absence of Pen Windows. In our DEMO application, this is easily accomplished with a small change to the DoCommand() function (see Figure 7) and the resource script (Figure 8). Figure 9 shows a screen shot of the resulting DEMO3.EXE program, which demonstrates the dialog with the BEDIT control in place.

THE IN-BOX

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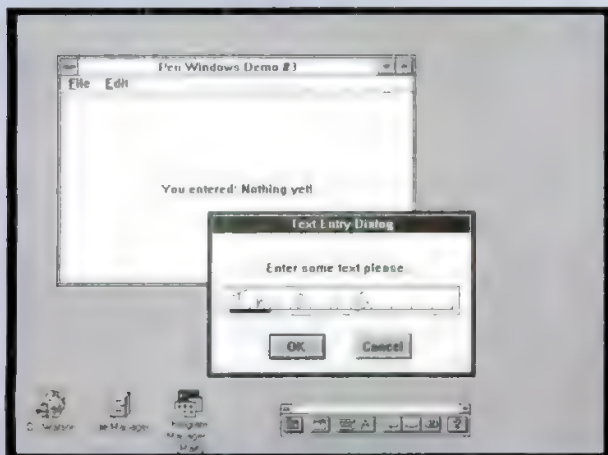


Figure 9: This screenshot shows DEMO3.EXE running under Pen Windows. The dialog box containing a BEDIT control is displayed. The screen shot is in monochrome because it was captured on the Wacom HD-648A integrated VGA display/input tablet.

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by
Sal Ricciardi

Databases

UNDERSTANDING COMMAND SCOPE

I recently discovered a situation in one of my *dBASE* applications where a **REPLACE** command was not actually replacing the data. The field to be replaced was in another work area, and the **REPLACE** command looked like this:

```
REPLACE BAL->AMOUNT WITH 0
```

After much examination, I discovered that if I switch to the **BAL** work area before the **REPLACE** command, and then switch back to my current work area afterward, the **REPLACE** command works.

Can you shed some light on this?
Robert White
Hoboken, New Jersey



To answer your question briefly: The **REPLACE** command in your example failed because the record pointer in your current work area was positioned at the end of file, and as a result the scope of the command resolved to 0 records. That's a mouthful for sure, but bear with me.

To understand this behavior, you need to understand how command scope works in the current *dBASE*-compatible languages. I'll use *dBASE IV* for the examples in this discussion, but the material applies equally well to *FoxPro*, *Clipper*, *FoxBASE Plus*, and the rest.

The scope of a command in *dBASE* specifies the set of records to which the command should be applied. For example, a scope of **NEXT 1** instructs *dBASE* to apply the command to the next record, starting with the current record. Similarly, a scope of **NEXT 3** applies the command to the next three records, starting with and including the current record. In addition to determining the set of records affected by a command, scope also affects the current record pointer. When a command with a scope of **ALL** or **REST** is completed, the current record pointer is always positioned at the end of file. The

■ **UNDERSTANDING COMMAND SCOPE:**
The pitfalls of command scope in *dBASE*-compatible languages—and four rules to help you avoid them.

four available scope clauses and their meanings are shown in Figure 1.

Every command that accepts a scope clause has a default scope that is used if you don't override it by specifying your own. For example, the **DISPLAY** command defaults to a scope of **NEXT 1**, which displays the current record. The **LIST** command, on the other hand, defaults to a scope of **ALL**, which starts at the beginning of the database and lists every record.

The biggest source of confusion regarding command scope is that the scope *always* applies to the current work area, even though the target of your operation may be another work area. (You'll recall that in *dBASE IV* you can have up to ten databases open simultaneously, each in its own work area with its own work area alias and current record pointer.)

For example, consider a command like

```
REPLACE PARTS->YTDSALES WITH 0
```

which **REPLACEs** the **YTDSALES** field in the current record in the **PARTS** work area with 0. This is equivalent to

```
REPLACE NEXT 1  
PARTS->YTDSALES WITH 0
```

When *dBASE* processes this command, it looks at the current work area, *not* the **PARTS** work area, to resolve the scope. Therefore, if your current work area is at the end of file, the **REPLACE** command

should do nothing. Commands that use a scope of **REST** or **NEXT n** when the current work area is at the end of file will at best do nothing, and at worst, simply not do what you expect.

The reason I say "at best do nothing" is because doing nothing is the *correct* behavior under those circumstances. Theoretically, a command with **NEXT n** or **REST** scope that begins with the current work area positioned at the end of file acts on a set of 0 records.

And the reason I say "not do what you expect" is that in my own testing I've found situations where *dBASE* behaves inconsistently when the current work area is at the end of file. And the various compatible dialects, contrary to popular belief, *do not* consistently handle this situation in the same manner. The bottom line is that you should never attempt to **REPLACE** a field in any work area while the current work area is at the end of file.

This is why it is important to consider scope's effect on the record pointer during a series of scoped commands. If the first command in a series leaves the record pointer at the end of file, the remaining scoped commands may have no effect whatsoever.

Let's illustrate some of the confusing aspects of scope by way of examples. We'll start with two databases; **CUST** is open in work area 1, **BAL** in work area 2, and **BAL** is the current work area.

```
. SET TALK OFF  
. SELECT 1  
. USE CUST  
. LIST
```

Record#	CUSTNO	LASTNAME
1	0001	Smiley
2	0002	Smuthers
3	0003	Smudley
4	0004	Smith
5	0005	Smagurkee

```
. GO TOP  
. SELECT 2  
. USE BAL  
. LIST
```


SCOPE KEYWORDS IN dBASE IV

ALL	All of the records in the database. <i>dBASE</i> positions the record pointer to the top of the database and applies the command to each record in sequence until end of file is reached. The record pointer is left at end of file.
NEXT <i>n</i>	The set of <i>n</i> records, starting with and including the current record. <i>dBASE</i> applies the command to the next <i>n</i> consecutive records, starting with and including the current record. The record pointer is left pointing to the last record in the set or end of file.
RECORD <i>n</i>	The single record whose record number is <i>n</i> . <i>dBASE</i> positions the record pointer to record <i>n</i> and applies the command to that record only. The record pointer remains pointing to record <i>n</i> .
REST	All of the remaining records in the database, starting with and including the current record. <i>dBASE</i> applies the command to all of the remaining records in the database until end of file is reached, starting with and including the current record. The record pointer is left at end of file.

Figure 1: The four possible scope clauses and their effects.

Record#	CUSTNO	AMOUNT
1	0001	10958.25
2	0002	2456789.00
3	0003	21.00
4	0004	113978.99
5	0005	7789.98

Note that CUST's record pointer is positioned on record 1 because of the GO TOP command, while BAL's is now at the end of file because of the LIST command. If you wanted to change the LASTNAME in record 1 of CUST from "Smiley" to "Smurkey", you might be tempted to try

```
REPLACE CUST->LASTNAME  
WITH "Smurkey"
```

Since the scope applies to the current work area, and the current work area, BAL, is at the end of file, the command does nothing.

If you LIST the CUST database after running this command, you'll see that "Smiley" has not been changed. This illustrates rule number one for effective use of scope in *dBASE*: You must always be aware of the record pointer position prior to issuing a scoped command. Because the current record pointer was at the end of file, the REPLACE command had no effect at all.

Let's consider a second example. But

first, position BAL to the top of the file and return to the CUST work area as follows:

```
. SELECT BAL  
. GO TOP  
. SELECT CUST
```

Now, suppose you want to change all of the values in the AMOUNT field in BAL to 0. Since you are currently in the CUST work area, you might be tempted to try

```
. SET TALK ON  
. REPLACE ALL BAL->AMOUNT  
WITH 0  
5 records replaced  
. SET TALK OFF
```

You may think that this has done the trick, but it hasn't. Taking a look at BAL after the REPLACE

```
. SELECT BAL  
. LIST  
Record#  CUSTNO  AMOUNT  
1      0001      0.00  
2      0002  2456789.00  
3      0003      21.00  
4      0004  113978.99  
5      0005      7789.98
```

you can see that only the amount in the first record was replaced. What happened?

Here's how it works:

- Since CUST was the current work area at the time the command was issued, *dBASE* evaluates the ALL scope using the CUST work area, and positions the record pointer to the first record in CUST.

- The REPLACE is performed, replacing AMOUNT in whatever record is current in BAL (the first record).

- The record pointer is moved to the next record in CUST, and the REPLACE again replaces AMOUNT with 0 in the current record in BAL (still the first).

- The record pointer is moved to the next record in CUST, and the REPLACE again replaces AMOUNT with 0 in the current record in BAL (still the first).

This sequence of moving to the next record in CUST and replacing the current record in BAL continues until the end of file is reached in the CUST work area. Note that throughout this operation, the record pointer is moved only in the current work area, CUST. The record pointer in BAL is never moved. The end result is that the same record in BAL is replaced five times, since the ALL scope, when derived from CUST, comprises five records.

This illustrates the second rule of effective use of scope in *dBASE*: The scope

RULES CONCERNING SCOPE IN dBASE

1. Always be aware of the record pointer position prior to issuing a scoped command.
2. The scope always applies to the current work area, regardless of the target work area of the command.
3. Aliased fields on scoped commands are best used with databases linked via relations.
4. If you have no database relations and you want to apply a scoped command to fields in another work area, always explicitly SELECT the target work area first.

Figure 2: Rules for effective use of command scope in *dBASE*-compatible languages.

always applies to the current work area, regardless of the target work area of the command.

The use of aliased fields (those preceded by a work area alias and the alias operator, such as BAL->AMOUNT) with commands like REPLACE makes more sense when you consider how they work with databases linked via relations. For example, consider the following:

```
. SELECT 1
. USE BAL ORDER CUSTNO
. SELECT 2
. USE CUST ORDER CUSTNO
. SET RELATION TO CUSTNO INTO
  BAL
. SET TALK ON
. REPLACE ALL BAL->AMOUNT
  WITH 5
5 records replaced
. SET TALK OFF
. DISPLAY ALL LASTNAME,
  BAL->AMOUNT
```

Record#	LASTNAME	BAL->AMOUNT
1	Smiley	\$.00
2	Smuthers	\$.00
3	Smudley	\$.00
4	Smith	\$.00
5	Smagurkee	\$.00

When databases are linked via a relation, the scope is still resolved using the current work area, but the two databases are moved in sync. Every movement in CUST results in a corresponding movement in BAL. This leads to the third rule for effective use of scope: Aliased fields on scoped commands are best used with databases that are linked via a relation.

What if you do *not* have any relations set and you want to REPLACE data in another work area? This leads to rule number four: If you have no database relations set and you want to apply a scoped command to fields in another work area, *always* explicitly SELECT the target work area first.

For example, with no relations set, this is the correct approach:

```
. SELECT BAL
. REPLACE ALL AMOUNT WITH 5
. SELECT CUST
```

and this is not (when the CUST work area is current):

```
. REPLACE ALL BAL->AMOUNT WITH 5
```

The fact that scope always applies to the

current work area is unfortunate in some circumstances. The solution is easy enough: Just explicitly select the appropriate work area before you issue the scoped command. But one of the attractions of the dBASE language is its English-like, easy-to-understand syntax. When a statement like

```
REPLACE ALL BAL->AMOUNT WITH 5
```

doesn't do what it says, it defeats the readability of dBASE.

It's difficult for vendors to change the behavior of scoped commands without compromising compatibility with existing applications. Since the main problem with scoped commands is that you cannot specify the work area to derive the scope from, perhaps syntax could be added that allows such a specification. For example

```
REPLACE ALL AMOUNT WITH 5
IN BAL
```

OR

```
REPLACE BAL->ALL AMOUNT WITH 5
```

Either of these commands would switch to the BAL work area, perform the operation, and then switch back to the current work area. On the other hand, perhaps the best solution is just to raise awareness of exactly how scope currently works.

Returning now to Mr. White's original problem, the REPLACE command failed because the current work area at the time the command was issued was at the end of file. Mr. White solved the problem by applying rule number four, explicitly selecting the target work area prior to issuing the command.

Command scope is one of the most frequently misunderstood aspects of the dBASE language. Using the rules in Figure 2, you should be able to avoid some of the pitfalls.

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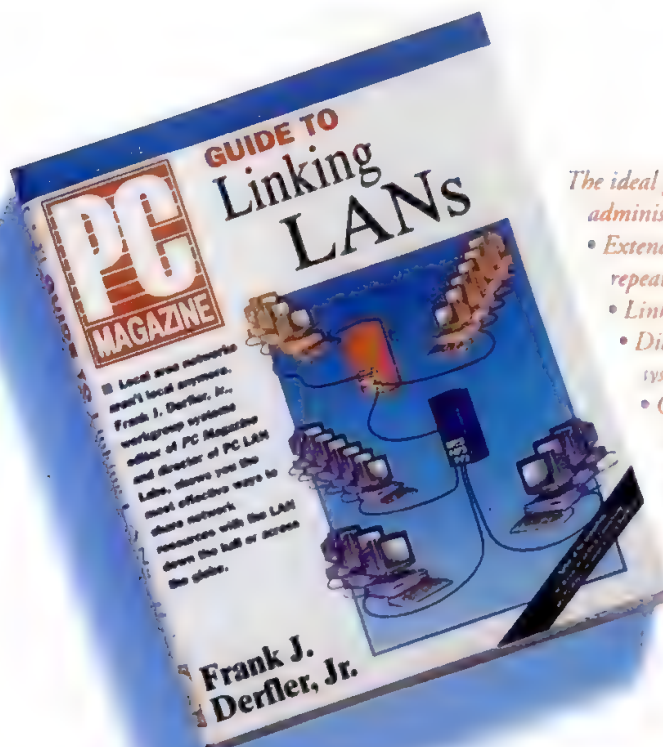
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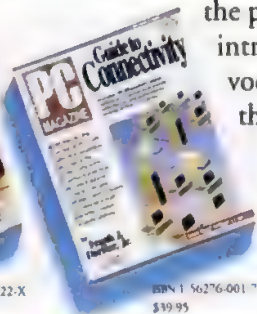
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Languages

CHANGING A FILE'S DATE AND TIME

Sometimes I'd like to change the date and time of an existing file. I've seen some routines that do this, but they're complicated and require accessing DOS system interrupts. My solution is very simple, and lets you assign any legal date and time to a file. The UPDATE subprogram shown in Figure 1 works by first setting a new system date and time (used by DOS). Next it opens the file for binary access, reads the first byte, and then writes that same byte back to the file. DOS is thus fooled into thinking the file has been changed.

Mike Zier
Smallwood, New York



Mr. Zier's program left the system date and time set to whatever date and time you chose for your file. I reworked his idea into a callable subroutine that can be added to any BASIC program. Although this version of UPDATE restores the date correctly, the time may fall behind by a half second or so, depending on how long it takes DOS to close the file. However, compared with the alternative of setting up and calling BASIC's INTERRUPT routine, this method is extremely simple and effective.—Ethan Winer

MANAGING A TPWIN DIALOG BOX

Many Windows applications can use a dialog box as a main window. Probably the most famous example of this is Charles Petzold's HEXCALC program and its Turbo Pascal for Windows (TPW) version, CALC. If you build this type of program using the ObjectWindows library, you may have noticed the strange behavior of the window when the program is loaded with a LOAD= statement in your WIN.INI file. The dialog box displays briefly as a full window, and then is iconized. And though the application works perfectly in other respects, this can be disconcerting for users.

- **CHANGING A FILE'S DATE AND TIME:** Easily modify the date and time stamp on any file with this QuickBASIC routine.
- **MANAGING A TPWIN DIALOG BOX:** If your program uses a dialog box as a main window, you may see some unexpected results.

A look at the ObjectWindows runtime library source code helps you see what's happening. The MakeWindow routine calls the CreateDialogParam API function, causing a dialog box to be shown any time it has the ws_Visible attribute. Then, after

MakeWindow itself is called, a call is made to MainWindow^.Show(CmdShow). But when a program is activated through the LOAD= statement, it receives the SW_MINIMIZE constant in the CmdShow parameter and is iconized. The effect is the same no matter how you create the dialog box or which CreateDialogxxxx function you use. The program and resource script shown in Figures 2 and 3 provide a demonstration.

To get around the problem, you should remove the ws_Visible attribute from the STYLE statement in the resource script or from the DLGTEMPLATE if you want to create the dialog on the fly, or uncheck that option in your Dialog Editor. Don't worry about the window not showing; if you load the program "normally" from the Program Manager, a call to MainWindow^.Show will be made anyway.

Patrick Philippot
Draveil, France

```
UPDATE.BAS                                     COMPLETE LISTING

'UPDATE.BAS - modifies a file's date and time stamp

DECLARE SUB UpDate (FileName$, InDate$, InTime$)

LINE INPUT "  File to update: ", FileName$
LINE INPUT "Enter a new date: ", NewDate$
LINE INPUT "Enter a new time: ", NewTime$

CALL UpDate(FileName$, NewDate$, NewTime$)

SUB UpDate (FileName$, InDate$, InTime$) STATIC

    DIM Temp AS STRING * 1
    FileNumber = FREEFILE
    'this receives a byte from the file
    'create a unique file number

    OPEN FileName$ FOR BINARY AS #FileNumber LEN = 1
    GET #FileNumber, 1, Temp$
    'get a byte then put a byte
    PUT #FileNumber, 1, Temp$
    'now the file appears to be changed

    SaveDate$ = DATE$
    SaveTime$ = TIME$
    'save the current system date and time

    DATE$ = InDate$
    TIME$ = InTime$
    'set a new date and time

    CLOSE #FileNumber
    'tell DOS to update the file's info

    DATE$ = SaveDate$
    TIME$ = SaveTime$
    'restore the original date and time

END SUB
```

Figure 1: This simple subprogram updates the date and time stamp on any disk file.

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PROGRAMMING LANGUAGES

DLGEXMPL.PAS

COMPLETE LISTING

```
program DlgExmpl;

{$R DlgExmpl.RES}

uses WObjects;

const
  {-Application name }
  AppName: PChar = 'DlgExmpl';

type
  {-Application object }
  TExampleApp = object(TApplication)
    procedure InitMainWindow; virtual;
  end;

var
  {-Application instance }
  ExampleApp: TExampleApp;

procedure TExampleApp.InitMainWindow;
begin
  MainWindow := New(PDialog, Init(nil, AppName));
  {-Could also be a TDlgWindow}
end;

begin
  ExampleApp.Init(AppName);
  ExampleApp.Run;
  ExampleApp.Done;
end.
```



Figure 2: This little program serves to demonstrate a problem with TPW programs whose main window consists of an initially visible dialog box.

DLGEXMPL.RC

COMPLETE LISTING

```
DlgExmpl DIALOG 10, 35, 253, 141
CAPTION "Example"
STYLE DS_MODALFRAME | WS_POPUP | WS_VISIBLE | WS_CAPTION | WS_SYSMENU | WS_MINIMIZEBOX
BEGIN
  CONTROL "Testing TDlgWindow", 101, "STATIC", WS_CHILD | WS_VISIBLE | SS_16, 86, 47, 88, 14
  CONTROL "OK", 100, "BUTTON", BS_DEFPUSHBUTTON | WS_TABSTOP, 220, 110, 24, 14
END
```

Figure 3: This resource script defines a minimal dialog box with `ws_Visible` selected.



To see this problem in action, first compile the resource script in Figure 3 with Borland's own Resource Workshop, or create a matching dialog box using the Whitewater Resource Toolkit. Then compile the program in Figure 2 with TPW. Finally edit the `LOAD=` line in your `WIN.INI` file to include the full pathname of the resulting `.EXE` file. Next time you start Windows, you'll see the described behavior: The window will pop up briefly, then iconize. Bring up your preferred resource editor, load the `.EXE` into it, and take away the `ws_Visible` style from the dialog box. The problem is gone!

Any time you write a TPW program whose main window is a `TDialog` or `TDlgWindow` descendant, you should create the dialog with the `ws_Visible` style

turned off. If your program is popular, users will want it instantly available when they start Windows: they'll put it in the `LOAD=` line of `WIN.INI`. You don't want your program to start acting peculiar just when folks are giving it the compliment of including it in their `LOAD=` line!

—Neil J. Rubenking

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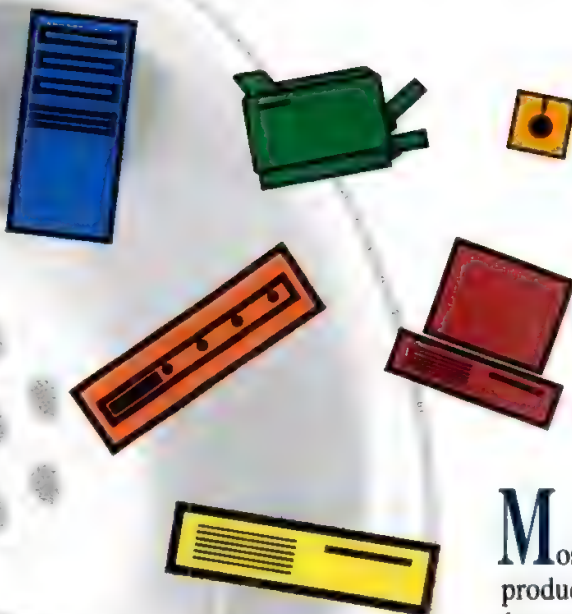
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We will promptly replace any defective items returned within 30 days, but cannot guarantee compatibility. There is a 15% restocking fee on any non-defective unused goods, and all returns must be accompanied by a Return Merchandise Authorization. Software products do sometimes require a license key. Merchandise may change for better or worse without notice. While ground shipments are free, we do ask \$11.00 per item for 2-day, \$22.00 per item for overnight, and \$4.50 for C.O.D. Although shipping charges may be slightly more, bulk orders can be a lot less. Although quantities available upon request, and please call us for any item not listed.

PC Magazine's Direct Marketing Connection for PC Products and Services



Most of you buy PC products and services through direct marketing channels. In fact, in a recent study of subscribers, 83% said they bought PC products from direct marketers.*

You buy direct because you know exactly what you need and you seek good value and fast delivery.

The following special section connects you with the direct marketers who are eager to please you. By having them all in one place, you can quickly zero in on what you need and which vendor you want to call.



JUST FOR BUYERS WHO MEAN BUSINESS.

DISK DRIVES

CD-ROM	
Hitcher Ext 680mb Kit.....	499
Sony Int 680mb Kit.....	379
Sound of Mammals / Encyclopedia 49/69	
MS Bookshelf Stat Pack.....	
World Atlas & Consultant CDs.....	99
Colorado	
DJ-10 40-120mb Int Tape.....	239
DJ-20 80-240mb Int Tape.....	299
External Kit.....	69

Toshiba 100mb IDE Kit

\$369
Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastMicro price. This kit comes with a fast 20mb 100mb drive and built in 11 controller, 16 bit IDE card with dual floppy controller & cables, 5.25" brackets & rails.

Conner (see FastData IDE controllers)
CP3044 40mb IDE 28ms.....199
CP3104 100mb IDE 25ms.....349
CP3208 200mb IDE 25ms.....549

DTC
6280 ESDI 16bit HD/FD Cont.....119
6280-15T 15mb/sec transfer rate.....169
Microplus (see DTC Controllers)
MC1864 345mb HH ESDI 14ms.....999
MC1568 668mb FH ESDI 14ms.....1399
MC1598 1gb FH ESDI 14ms.....1999

Plus Development
HardCard IXL 50mb 9 ms 16bit.....299
HardCard IXL 105mb 9 ms 16bit.....469

Seagate 89mb AT Kit \$319
IDE performance, big 89 megabyte capacity, 19ms access time and 5 mbps transfer rate make this a great buy. Controller, cables and rails are included to make installation fast and easy.

Seagate
30MB XT Kit ST238 w/ cont.....249
40MB AT ST251-1 MF Drive.....229
40MB AT ST157A 28ms IDE Drive.....179
89MB ST3096A 19ms IDE Drive.....299
125MB ST3144A 19ms IDE Drive.....359
210MB ST1239A 15ms IDE Drive.....599
330MB ST2383E 16ms ESDI Drive 1199

Teac
1 2MB 5.25" Floppy.....65
1 44MB 3.5" Floppy.....65

Toshiba 1.44mb Floppy \$59
Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write format 720K 3.5" disks. Rails, add \$5.

Toshiba
360K 5.25" Floppy (Black).....59
1 2MB 5.25" Floppy.....59
1 44MB 3.5" Floppy.....59
107mb 1034 IDE 3.5" drive.....349

Western Digital
WD93044 40mb IDE 28ms.....199
WDAC280 80mb IDE 20ms.....299
WDAP4200 200mb IDE 20ms.....599

MODEMS & FAX

ATI	
2400 ETC Internal / External.....	129/159
9600/E External MNP V 42bis.....	369

ATI \$369 9600ETC-E
ATI delivers speed and accuracy with the 9600 ETC-E. It includes V.42, LAP-M, and MNP error correction combined with MNP/5 and V.42 bis data compression to provide total high-speed throughput. It features automatic line speed correction, synchronous/asynchronous communication and automatic feature negotiation with connecting with other modems.

Everex 2400B Int Modem.....69
Hayes
JT FAX 4800B Internal.....139
Personal Modem 2400 w/Prodigy.....119
Pocket Edition 2400 Modem.....119

Intel
Classic 2400 Modem Int / Ext.....139/169
Satisfaction Classic - Intl 9600.....379
Practical Peripherals

OmniLink Laser \$379
Don't settle for curled up thermal paper or tie up your PC to receive faxes. Get OmniLink Laser. It connects to your phone line and HP compatible laser and receives and prints your faxes. You can still print anything you want and OmniLink will store up to 30 faxes while your printing. Plus, it's a standard 2100/9600 modems and fax and software only \$89.

2400B Int Modem Std/MNP.....125/159
PM9600SA Ext V 32/V 42bis.....449
USRobotics
2400 Sportster Int / Ext.....119/135
2400 Sportster MNP Int / Ext.....159/189
9600 Sportster Int / Ext.....399/449
Comer HST 14 400 Int / Ext.....539/579
Comer HST 14 400 Dual Std Ext.....839
WorldPort 2496 Pocket Modem/Fax.....309

ZOOM
HC2400 Internal.....69
2400 V.42bis External Modem.....129
9624 Send/Receive Int Fax Modem.....109

MICE & INPUT

Key Tronic 101 Keyboard.....59
Professional Mouse.....59
Logitech
Mouseman Serial righthand.....59
Mouseman Serial with Windows.....109
Mouseman Bus righthand.....65
Mouseman Cordless.....85
ScanMan 32.....159
ScanMan 32 with Catchword.....199
ScanMan 256 for Windows.....279
Trackman Serial.....65

Microsoft Mouse \$83
Ergonomic design and 300 DPI accuracy make this the world's most popular mouse. Microsoft design and mouse utilities assure compatibility with the programs you use most.

Microsoft
Serial or Bus Mouse only.....83
Serial or Bus with paint.....95
Serial with Windows.....147
Z-Nix Super Mouse II w/Windows.....79

NETWORKING

Artisoft/LanTastic
LanTastic 2 Station Starter Kit.....349
2 Mbps.....469
Ethernet.....209
Ethernet Additional Stations.....469
Eagle
NE2000 2 Station NW Lite Kit.....459
FastData NE2000 16 bit 10-BaseT.....109
Novell
Netware Lite.....65

FASTDATA PRODUCTS

FastData 16 Bit VGA \$59 \$69
The FastData 16 bit VGA card features 512K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money back guarantee.

FastData 16bit 1mb VGA.....89
FastData CGA Card.....35
FastData MGP Card.....29

FastData Monitors
Your best value, guaranteed! We have full line manufacturers for us by name: factories like Hyundai and Mitsubishi. X with a FastData branded product, you get a full 30 day money back satisfaction guarantee. Shown is the VGA color.

BOARDS & CHIPS

AdLib Gold 1000 2000	185	285
ATI Stereo F X		129
Creative Labs		
Sound Blaster	109	
Sound Blaster Pro (stereo & MIDI)	189	
Cyrix 387 DX25 33	179	195
387-SX16 20	115	129
Everex		
RAM3000 16 bit - w/ OK (max 3mb)	75	
RAM3000 16 bit - w/ 1mb	125	
RAM8000 16 bit - w/ OK (max 8 mb)	169	
RAM8000 16 bit - w/ 2mb	269	
Intel 287XL	85	
387-DX25 or 33	209	
387-SX16 20	129	139
Memory - 1mb SIMMS 80ns	49	
Memory - 1mb chips 80ns set of 9	59	

FastData Boards
9600B SendFax w 2400B Modem.....79
9600B Send/Receive Fax w 2400B.....99
Ethernet 16bit 10Base-T.....109
IDE 16 bit 1 Hard Floppy Disk Cont.....29
IDE HD F - w Par 2 Serial Game.....39
Parallel2 Serial Game Card.....29
XT 144 Dual Floppy Controller.....35

FastData 2400 Baud Modem \$49
The FastData 2400 baud internal modem is configured to COM port 4. It has an internal speaker, is auto answer & auto dial, comes with communications software.

FastData Monitors
14" Amber or White Monochrome.....99
14" White VGA Monochrome.....119
14" CGA Color 52 dot pitch.....199
14" Super VGA 1024 x 768 28 dp.....299
14" Non-Int VGA 1024 x 768 28 dp.....369

VIDEO & MONITORS

ATI
Graphics Vantage 1mb.....389
VGA Basic 16 Integra.....75/129
VGA Wonder XL 256K 1mb.....169/229
8514 Ultra 8514-VGA 1mb.....599
Diamond
SpeedStar Plus HiColor 1mb.....189
Stealth VRAM HiColor 1mb.....265
Everex EGA 480 Card.....69
FastData Monitors & Cards.....see above
Hercules Graphic Card +.....Call
MAG Colorview/15.....Call
Mitsubishi
1410 EGA.....325
Diamond Scan 1381.....499
Diamond Scan 16L.....919
NEC
Multisync GS 2a.....199
Multisync 3FG.....599
Multisync 4FG.....749
Orchid
ProDesigner IIs 1mb.....219
Fahrenheit 1280s HiColor.....319
Panasonic C1381 VGA.....369
Seiko CM1440/CM1450.....489/569
Sony 1304 Multiscan.....599
Vision 7
VGA 1024/256K 512K.....129/149
V-RAM II VGA 512K / 1mb.....249/319
Zenith 1492.....599

Sound Blaster \$109
Sound Blaster does for sound what VGA does for graphics. Supported by the largest software library, Sound Blaster makes your games come alive. Also includes a music synthesizer, input and sound compression, and MIDI interface. SB Talker even converts text into spoken English. Includes a game port also.

PRINTERS

Canon
BJ10XE Portable.....319
BJ300 BJ330 Ink Jet.....459/599
LBP 4 Laser.....799
Citizen
200GX 9 Pin.....159
GSX 130 24 P.n.....249
GSX140 - 24 Pin.....295
GSX145 24 Pin Wide.....395
PN48 Std Pro.....299/329
NEC
P3200 24 Pin.....269
P3300 24 Pin Wide.....369
P6200 6300.....469/629
Silentwriter 2 Model 90.....1550
Okidata
Okilaser 400.....669

Panasonic 1124i \$299

The Panasonic KX 1124i is the ideal high-end 24 pin printer at a low-end price. It features up to 300 cps speed, 8 letter quality fonts, 10 pitch selections and more. It features an E-Z set operator panel and LCD display to make changing settings a breeze. It includes a two-year warranty too!

Panasonic
KXP1180 9 Pin.....155
KXP1123 24 Pin.....239
KXP1124i 24 Pin.....289
KXP1624 24 Pin Wide.....369
KXP2624 24 Pin Quiet.....459
KXP4420 Laser.....699
KXP4450i / 4455 Lasers.....Call
Seiko Smart Label Printer Plus.....167
Star
NX1001.....149
NX2410 / 2415.....239/369
XB2410 / 2415.....419/539
Texas Instruments
Microlaser PS17.....1199
Microlaser PS35.....1499

FastData 286/12

\$699

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Key Tronic keyboard. And since it's a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms IDE hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add \$59)
- ✓ Standard chassis (shown)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Math coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, game port, & 2 serial ports.
- ✓ Key Tronic enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ MS-DOS 5.0.
- ✓ Full documentation.
- ✓ FCC Class B approved.



	286/12	40mb	80mb	100mb	200mb
Monochrome	\$699	\$829	\$899	\$1,149	
Monochrome VGA	\$799	\$929	\$999	\$1,249	
VGA Color	\$949	\$1,079	\$1,149	\$1,399	
VGA 1024i	\$999	\$1,129	\$1,199	\$1,449	

DATABASE & FORMS

askSam 5.0	209
Clarion Personal Developer	45
Clarion Professional Developer	449
Clipper 5.01	489
DataEase	509
dBase III+	419
dBase IV	449
dBXL Diamond	129
Formbase	299
FormTool Gold	52
Formfiller	79
Formbase Plus	179
FoxPro 2.0	449
Paradox 3.5	449
Paradox Competitive Upgrade	165
Paradox SE	65
PerForm Designer & Filler	89
Personal Rbase	79
Q & A 4.0	249
RapidFile	99
Rbase for DOS	447
Reflex	159

Paradox SE \$65

New Paradox SE is a special version of the award-winning database management software designed especially for small business and home use. Just enter your data and Paradox SE lets you query, graph, sort, even write reports and form letters. Easy to use and learn. You can create multi-table data-entry applications without programming.



ENTERTAINMENT

Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry III	35
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
PC Globe or PC USA	35
Simcity	28
SimEarth	39
Wing Commander I / II	39 / 45

DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	239
Bannermania	21
Express Publisher	Call
Microsoft Publisher for Windows	129
Pagemaker 4.0	489

Microsoft \$129 Publisher

New Microsoft Publisher for Windows gives you easy-to-use page layout, text and graphics tools to create publications quickly. It includes a built-in word processor with spell checker and import text from any major word processor. Also includes PageWizard step by step publication creation, WordArt text special effects, and Toolbars - access to frequently used functions are a click away. Also comes with 100+ clip art images, border art, drawing tools & more.



PFS:First Publisher	89
Printshop	33
Publisher's Paintbrush	279
Publish It!	129
Ventura Publisher Gold / Windows	499

FINANCIAL

ACCPAC BPI Value Pak	359
Bedford Integrated Acct.	119
Checkfree	19
DAC Accounting 4.2	85
DAC Bonus Pack 4.2	127
Dollars & Sense	39
Managing Your Money	109
Microsoft Money for Windows	409
Money Matters	29
One Write Plus G/L, A/P & A/R	165
Pacioli 2000	269
Peachtree Crystal Acctg. Windows	175
Peachtree Complete III	139
Peachtree with Data Query	209
Quicken	41
The Manager's Organizer	139
Timeslips III	179
Wealth Builder	89

WINDOWS SOFTWARE

3-D Charts to Go for Windows	55
ACCPAC Simply Acctg for Windows	119
Adobe Illustrator	299
Adobe Streamline	119
Adobe Type Sets	Call
Adobe Type Align	59
Adobe Type Manager	59
Adobe Type Manager Plus Pack	115
After Dark for Windows	25
Ami Pro 2.0	279
Ami Pro 2.0 Competitive Upgrade	119
Asymetrix Toolbook	279

Windows 3.0 \$89

Get in on the Windows revolution! Windows turns your 286 or above into a powerful multitasking workstation that runs even non-Windows applications. Includes many integrated applications standard. Plus, if you buy Windows from FastMicro, we'll throw in 12 of the best Windows shareware programs free!

MicroPhone II	89
Microsoft Ent. Pack I, II, or III	27
Microsoft Mouse w/ Windows 3.0	147
Microsoft Office (Word/Excel/PowerPoint)	447
Microsoft PowerPoint for Windows	309
Microsoft Productivity Pack	39
Microsoft Windows	89
Microsoft Windows Developer's Kit	309
Microsoft Word for Windows	299
MYOB	129
Norton Backup	85
Norton Desktop	95
ObjectVision for Windows	89
On Target	229
PackRat 3.0	239



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maximizes performance while running After Dark. Also features DOS blanking and two-level password protection, and sound! It includes a programmable quick-sleep hot key and total network compatibility.

Pagemaker 4.0	489
Persuasion	319
Per Form Pro	179
PFS WindowWorks	119
Pro Write Plus	159
Project for Windows	429
Publisher's Powerpak	45
Publisher's Paintbrush	279
Quattro Pro for Windows	Call
RightWriter	Call
SuperBase 4	419
Turbo Pascal for Windows	119
Ventura Publisher	519
WideAngle for Windows	62
Winconnect	59
Windows Draw	145
WinFax Pro	69



essor and PowerPoint is the top presentation package. Act now and you will save half the cost if purchased separately.

BeckerTools Plus	Call
Bitstream Facelift	57
Corel Draw 2.0	349
Correct Grammar	57
Current	119
DBlast/Windows	239
DynaComm 3.0 Async	139
Excel	299
Facelift	57
Form Publisher	139
Grammatik IV for Windows	55
HDC First Apps or Windows Express	55
Instant Orgchart	119

1-2-3 & Ami Pro Double Upgrade \$139 wow!

Lotus users! This upgrade includes the hot new 1-2-3 for Windows and the new Ami Pro 2.0 1-2-3/W. Includes SmartIcons, 3-D charting, true 3-D worksheets, and database links. Use Windows pull down menus or press slash and Classic 1-2-3 menus appear. Ami Pro 2.0 is the new version of the award winning Windows word processor. It includes new customizable SmartIcons, 1-2-3 data exchange, outlining, style sheets, revision marking, and more.

JustWrite	129
Lotus 1-2-3 for Windows	379
Lotus 1-2-3 Competitive Upgrade	119
Micrographix Designer	449



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GRAPHICS

Autosketch 3.0	139
Corel Draw 2.0	349
Design CADD 3-D	185
DrawPerfect	259
Freelance Graphics 4.0	299
Freelance Competitive Upgrade	89
Generic 3D Drafting	199
Generic Cadd Level 2 Starter Kit	89
Generic Cadd 5.0	279
Harvard Graphics	Call
PC Paintbrush IV Plus	109

PC Tools \$99 Deluxe 7.0

New PC Tools 7.0 is the perfect set of utilities for DOS 5. Includes new application menu system, remote operation of another PC, advanced data recovery and an enhanced Backup in DOS and Windows versions. Anti-Virus, which recognizes over 400 known viruses and even detects unknown ones is included as a free bonus.



INTEGRATED

First Choice	95
Framework XE	95
Geoworks Ensemble	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89
Works w/ MS Serial Mouse	149

PROGRAMMING

Borland C++	299
Borland ObjectVision for Windows	89
Turbo Pascal Dos/Windows	90/119
Macro Assembler	95
Microsoft C Compiler	303
Quick Basic	60
Quick C or Quick Pascal	120
Visual Basic for Windows	65
Windows Developer's Kit	309

SPREADSHEETS

Always	115
Excel for Windows	299
Lotus 1-2-3 version 2.3	325
Lotus 1-2-3 version 3.1+	399
Lotus Upgrades	Call

Lotus 1-2-3 2.3 \$325

The powerful spreadsheet that runs on any PC. New WYSIWYG display mouse support, 200 graph types, drawing tools, and other graphics features to make spreadsheet publishing a breeze. Release 2.3 also adds auto-compress printing, auditor, file viewer, context sensitive help, print preview and more. Call us for upgrade information too!



Quattro Pro 3.0	289
Quattro Pro 3.0 Comp. Upgrade	89
Quattro Pro 3.0 SE	45
Supercalc 5.1	89

WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik IV	55
LetterPerfect	119
Multimate 4.0	267
Professional Write	159
Publisher's PowerPak / WordPerfect	45

WordPerfect 5.1 \$239

WordPerfect is the #1 rated word processing software. Its got almost every feature imaginable and yet it is easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!

RightWriter	55
Spell	117
Word	209
Word Perfect 5.1	239
Word Perfect for Windows	249
Word Perfect Add'l Station	159
Word Perfect Office	89
WordStar Professional	187
Writer's Toolkit	85

UTILITIES

386 MAX	59
Address Book Plus	47
Calendar Creator Plus	47
Central Point Backup	75
Checkit	79
Company Ladder	45
Control Room	89

MS-DOS 5.0 \$55

The new Microsoft DOS 5.0 frees 45K or more for DOS on 286 & 386 PCs. It includes a new Shell, Uninstall and Unformat, new Editor and more. Also includes Qbasic, Command

Line Help, new Backup and Windows enhancements. Plus, you can install it on your drive without reformatting, even on Networks. This official upgrade pack requires that you simply have an older command.com on your drive!

CoreFast	60
Carbon Copy Plus	105
Desqview 2.4	75
Desqview 386 2.4/6.0	125
Direct Access	57
Disk Manager Dos / Novell	36 / 95
Disk Optimizer	29
DR DOS 6.0	65
GoScript 3.0	89
Fastback Plus	109
Headroom	59
Hijack 2.0	95
InfoSpotter	45
Labels Unlimited	45
Laplink Pro	89
Microsoft Learning DOS	32
MS-DOS 5.0 Upgrade	55
Norton AntiVirus	79
Norton Backup	90
Norton Commander	90
Norton Utilities 6.0	109

Stacker 2.0 \$79

PC Magazine 1991 Technical Excellence winner. Stacker doubles the capacity of your hard disk in minutes, without reformatting. It compresses files in the background transparently giving you the extra room you need. For greater performance, the Stacker AT/16 with 16 bit coprocessor card (\$179) is ideal.



PC Anywhere IV	109
PC Tools Deluxe 7.0	99
Personal Lawyer	34
P.D. Queue	55
PFS Preface	47
Pop Drop Plus	53
PrintRite	19
ProComm Plus	59
Prodigy	25
QA Plus	85
QEMM 386 6.0	59
QRAM 2.0	49
SideKick 2.0	53
Sideways	55
SmartComm Exec	69
Super PC Kwik	43
Virex-PC	75
XTree Gold 2.0	89

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 For customer service call: 602-431-8100
 Canada/International sales call: 602-431-8200
 FAX: 602-431-8300

Hard Disks Die.

Hard disk manufacturers want us to believe that hard disk technology is absolutely reliable ... but experience teaches otherwise. We depend upon data storage to be flawless,

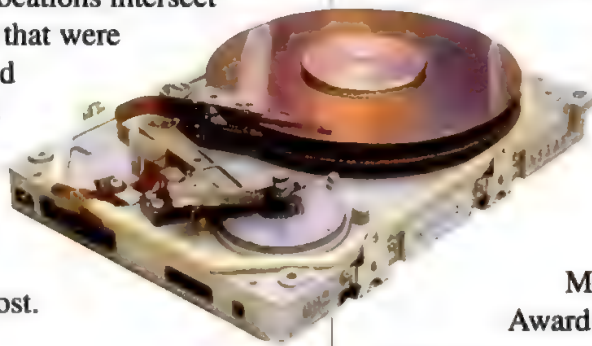
but hard disk technology isn't. Surface defects, head alignment drift, and low-level format aging cause hard disks to fail.

A hard disk drive's low-level format fades with use. The drive's read/write heads lose their delicate alignment and move away from the original low-level format information. These new data track locations intersect unseen surface defects that were once harmlessly located between tracks. DOS's chilling "Abort, Retry, or Fail ?" message inevitably results. Precious data is soon lost.

If left unchecked, data storage becomes more an act of hope and faith than one of science.

A return to science. The problem is known and understood, and the solution is clear. While a drive's data can still be read, the drive must be given a new, realigned and strong low-level format. Then all current surface defects must be located and managed.

This process prevents hard disk data loss.



An act of prevention. Gibson Research Corporation's SpinRite™ software program reads hard-to-read and impossible-to-read data from a DOS hard disk, nondestructively low-level reformats the drive's surface while optimizing the sector interleave factor, analyzes and scrubs each track of the drive for surface defects, and relocates any endangered data to safety. SpinRite easily restores hard disk drives to better-than-new condition with their data intact. Before any data is lost, SpinRite detects that a drive is "softening"

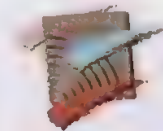
then determines and eliminates the cause. SpinRite readily recovers data that the system cannot read.

SpinRite won Byte Magazine's prestigious Award of Distinction and

continues to win computer industry praise and acclaim. It has proven itself to be effective in preventing hard disk failure. SpinRite will work for you.

Spin Rite II features a detailed technical log, as well as support for DOS 5 and large device driver partitions.

SPINRITE



\$69

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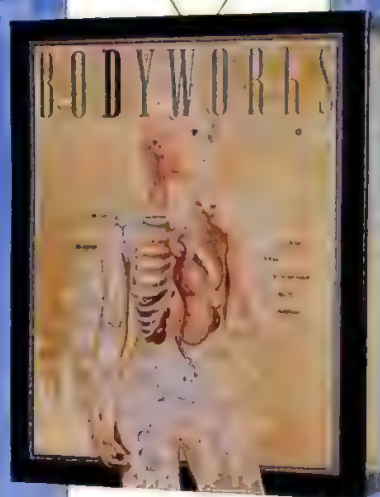
1-818-884-5310

Prices subject to change without notice

SpinRite II.
A return to science.
An act of prevention.

CIRCLE 017 ON READER SERVICE CARD

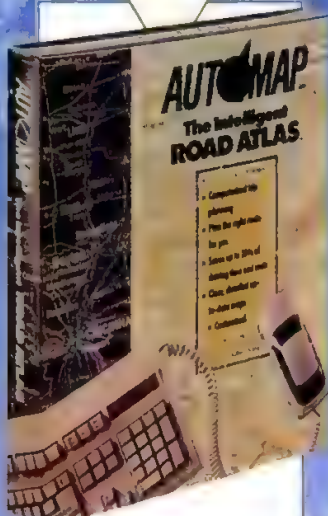
Retail \$79.95

\$59

BY SOFTWARE MARKETING CORP.

The human body is the ultimate machine, and now you can explore its systems, structures and functions in fascinating detail. Bodyworks lets you focus on skeletal, muscular, nervous, digestive, cardiovascular, reproductive and other systems. It also includes a Health Section with information on first aid, general fitness, sports injuries and common illness.

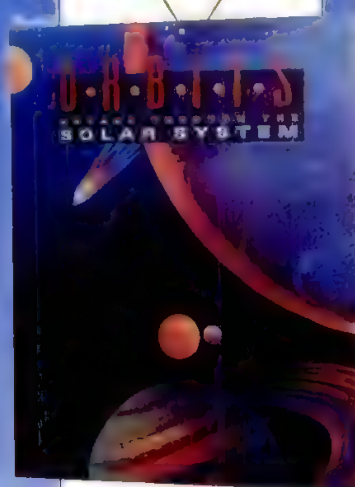
Retail \$99.95

\$59

BY AUTOMAP INC.

Clear, detailed maps that can get you anywhere in the United States. Just tell Automap where you are going, where you're starting from, what areas you'd like to visit (or avoid) and how you drive. View your entire journey in full color on the screen, or print out for easy reference. Its fast, fun and informative, plus it pays for itself in saved fuel and time.

Retail \$59.95

\$39

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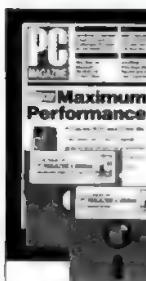
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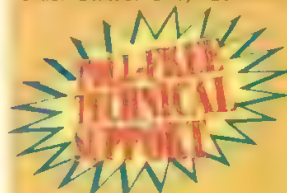
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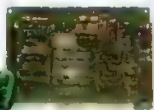


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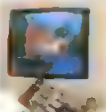
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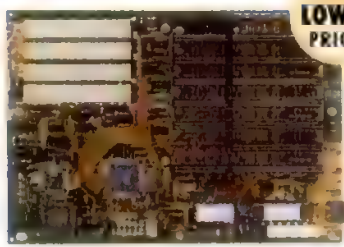
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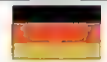
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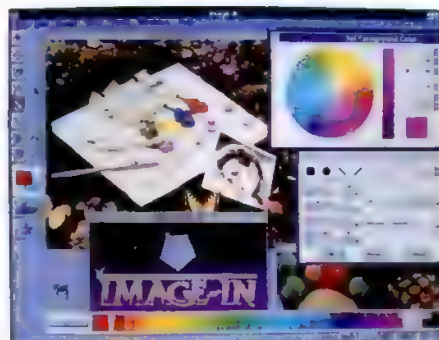


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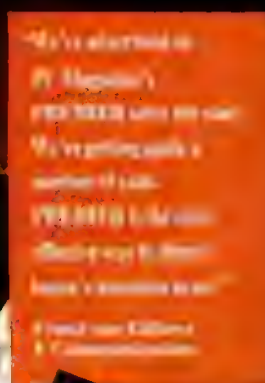
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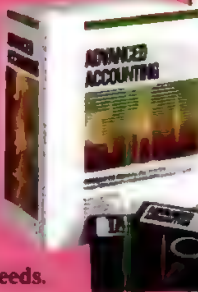
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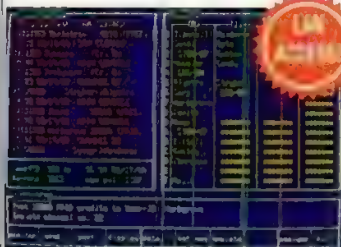
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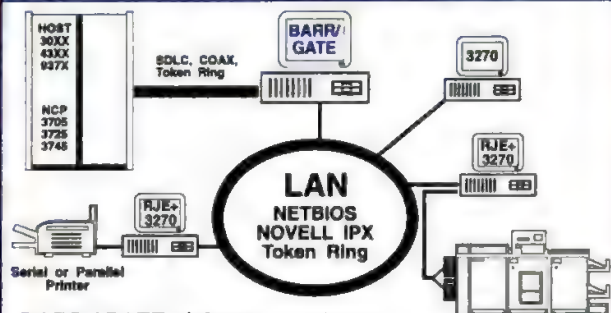
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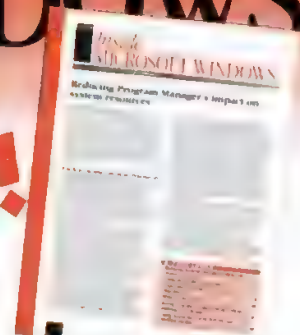
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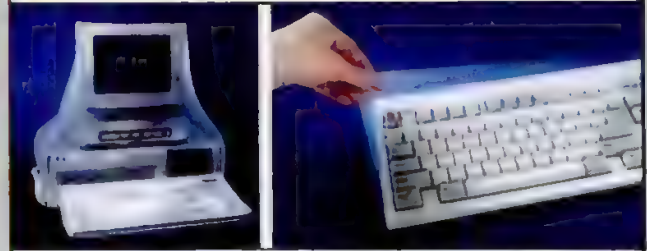
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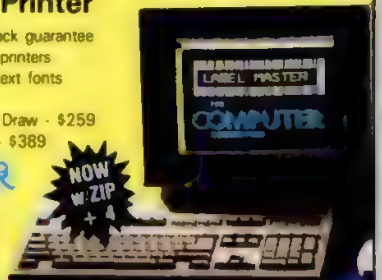
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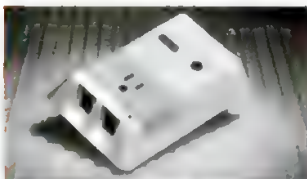
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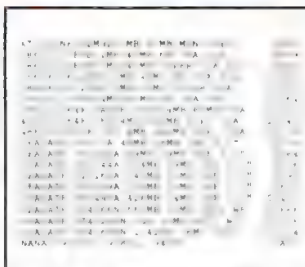
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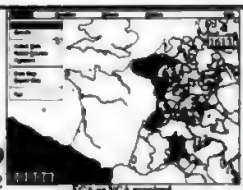
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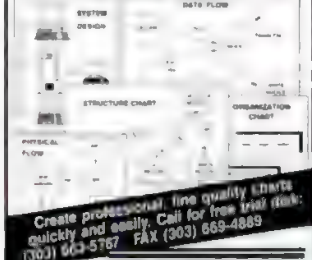
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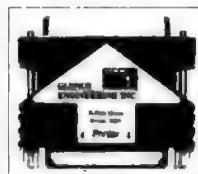
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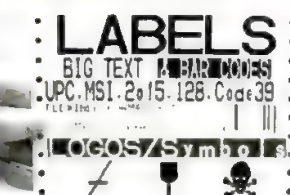
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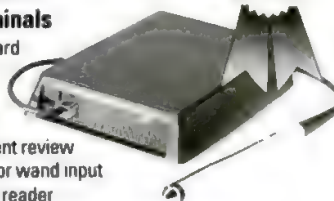
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PC 2/25

PC 2/25-6

1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one only)

- 01. ☐ Manufacturer of Computer Equipment, Computers, Software
- 02. ☐ Manufacturer—Aerospace
- 03. ☐ Manufacturer—Other
- 04. ☐ Systems House
- 05. ☐ Computer Consultant
- 06. ☐ Computer Retailer/VAR/VAD Distributor
- 07. ☐ Communications
- 08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
- 09. ☐ Education
- 10. ☐ Government—Federal
- 11. ☐ Government—Non-Federal
- 12. ☐ Research and Development
- 13. ☐ Data Processing/Computer Service
- 14. ☐ Health/Medical/Legal Service
- 15. ☐ Engineering/Architecture

16. ☐ Agriculture/Construction/Mining/Oil/Transportation/Utilities

- 17. ☐ Non-Computer Retailer/Distributor
- 18. ☐ Other Business or Service
- 19. ☐ Other

3. Please indicate your primary business function: (Check one only)

- 01. ☐ DP/MIS
- 02. ☐ Systems, Programming
- 03. ☐ Communications
- 04. ☐ Engineering
- 05. ☐ Res./Dev./Scientific
- 06. ☐ Accounting/Finance
- 07. ☐ Computer Consulting
- 08. ☐ Purchasing
- 09. ☐ Operations
- 10. ☐ Production
- 11. ☐ Education/Training
- 12. ☐ Marketing/Sales
- 13. ☐ Medical/Legal
- 14. ☐ Admin./Mgmt.
- 99. ☐ Other

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:

- 01. ☐ 10 or less 03. ☐ 26-99
- 02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office? (Check all that apply)

- 01. ☐ Linked to mainframe
- 02. ☐ Linked to mini
- 03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply)

- 01. ☐ IBM or Compatible PCs
- 02. ☐ IBM or Compatible Mainframes
- 03. ☐ IBM or Compatible Minis
- 04. ☐ Macintosh

8. Do you plan to buy any PC Products?
01. ☐ Now

- 02. ☐ In 4 to 6 months
- 03. ☐ In 7 to 12 months
- 04. ☐ No definite plans

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PRESENTATION GRAPHICS

The presentation graphics market has been abuzz with activity lately, with a spate of new Windows-based products to keep *Microsoft PowerPoint* company, as well as updates of familiar faces like *CA-Cricket Presents* and *Harvard Graphics*. *PC Magazine* rounds up ten of the latest contenders and tells you which will sink and which will swim in today's tight marketplace. And in case slides on a screen aren't enough, we look to the near future, when presentation graphics will marry new technology in multimedia.

EISA AND MCA FILE SERVERS

What's the ideal *NetWare* file server, and what strains will 32 workstations place on it? *PC Magazine Labs* set out to find the answers. We asked 22 vendors to send us EISA- or MCA-bus, 33-MHz 80486-based computers, configured to run a 32-node network, then put the machines through our network tests. In this roundup, *PC Magazine* helps you configure your ideal server.

V.32BIS MODEMS

They aren't V.fast (yet), but they're probably fast enough for you. The *PC Magazine* connectivity team dials up ten V.32bis modems. With an actual modulation speed of 14,400 bits per second and 4:1 compression thanks to V.42bis, these state-of-the-art modems can theoretically pull in data at speeds of up to 57,600 bps. Can your serial port handle this much excellence?

VIDEO ACCELERATOR BOARDS

In the past, if you wanted your applications to run faster, you had to buy a costly coprocessor board. Now, video accelerator boards may be the next new graphics standard. They speed up your GUI applications (like Windows, Presentation Manager, and *AutoCAD*), offering five to ten times the performance of vanilla VGA boards. And they do it cheaply. *PC Magazine Labs* tests the latest video accelerators to see if their performance is worth the investment.

UTILITIES

While laptops have grown more powerful to meet the challenge of Windows, the display technology is sadly lagging behind. Liquid Crystal Display screens lack the speed and contrast needed to display the tiniest of Windows features, the Windows cursor or pointer. Next issue's utility, *WINPTR*, is a Windows program that increases the visibility of the Windows cursor. It highlights the cursor so that with even the slightest mouse movement you'll be able to spot it easily on an LCD screen.

LAB NOTES

With today's emphasis on processor speed, we often equate a computer's speed with its processor speed. But in fact, the processor is just one of three subsystems that determine the speed of your machine. Next issue's Lab Notes will explore the different designs of the memory subsystem, how they affect the speed of your computer, and how their speeds must match those of the other subsystems.

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489	LapLink Pro, Version 4.0	Traveling Software Inc.	212	466	Tandy 101-Key Enhanced Keyboard	Northgate Computer Systems Inc.	325	422	Microsoft Mouse Software, Version 8.1	Microsoft Corp.	46
484	CD/Session, Version 6.01	Triton Technologies Inc.	210	478	Keyboard and Mouse Support	Radio Shack/Tandy Corp.	329	417	Monotype Desktop Solutions	Monotype Typography Inc.	56
480	BLAST Professional DOS, Version 10.5.1	US Robotics Software	192	478	Compu-Rest Arm Support	Wholesale Ergonomic Products	314	409	Qmodem, Version 5.0	Mustang Software Inc.	64
COMPUTERS				479	Wrist Pro	Wholesale Ergonomic Products	314	416	EndNote Plus, Version 1.0	Niles & Associates Inc.	66
406	Compaq Deskpro 486/50L	Compaq Computer Corp.	60	479	Ergonomic Solutions to Keyboard Comfort Productivity and Safety	Wrist Pro	314	508	Personal Tax Edge	Parsons Technology Inc.	289
429	Compaq Portable 486c	Compaq Computer Corp.	40	PRINTERS				404	PC DOCS, Version 4.0	PC DOCS Inc.	59
412	Tempo Carner 386SX/20 with 2MB RAM	Everex Systems Inc.	64	415	Mitsubishi CP-500	Mitsubishi Professional Electronics	66	402	PackRat for Networks, Version 4.0	Polans Software	59
410	Mpression Mono-386SX/16	Micronics Computers Inc.	64	424	QMS-PS 1700	QMS Inc.	44	428	Your Way 2.0	Prisma Software Corp.	50
423	Pision Series 3	Pision Inc.	48	READ ONLY				426	Way You Work, Version 2.01	Proteo Technology Corp.	50
427	T4400SX	Toshiba America Information Systems Inc.	37	492	The Design of OS/2	Addison-Wesley Publishing Co.	71	430	MailMan for NetWare MHS	Reach Software Corp.	52
GRAPHICS				493	The Little Laptop Book	Peachpit Press	71	507	J.K. Lasser's Your Income Tax Software	Simon & Schuster Software	284
468	DeScribe Word Processor, Version 3.0	DeScribe Inc.	124	494	The Laptop User's Survival Guide	Sybase Inc.	71	425	Harvard Graphics for Windows	Software Publishing Corp.	37
467	Ami Pro, Version 2.0	Lotus Development Corp.	119	PRODUCTIVITY				506	EasyTax	Timeworks Inc.	283
470	Microsoft Word for Windows, Version 2.0	Microsoft Corp.	128	DEPARTMENT				TOOLKITS			
471	Professional Write Plus, Version 1.03	Software Publishing Corp.	156	SOLUTIONS				451	Ocelot2-The SQL1, Version 2.12	Ocelot Computer Systems Inc.	77
469	JustWrite, Version 1.0	Symantec Corp.	126	Advisor	How to contact the new owners of SMARTKEY		331	450	Quadbase-SQL/Win, Version 1.2	Quadbase Systems Inc.	77
472	WordPerfect 5.1 for Windows	WordPerfect Corp.	167	Advisor	Updating Logitech mouse drivers		331	DEPARTMENT			
473	WordStar for Windows, Version 1.0	WordStar International Inc.	176	Advisor	Six packages to help you manage baseball stats		331	PROGRAM NAME / DESCRIPTION			
HARDWARE				Advisor	How to get in touch with DacEasy		331	PAGE			
408	Acceat	ACECAD	64	Tutor	How to get PC Magazine utilities when you don't have a modem		331	SOLUTIONS			
495	DTC 6195-EISA ESDI Disk Controller	Data Technology, a division of Qume Corp.	260	Tutor	Copy files between floppies in the same drive without endless disk swapping.		335	Advisor	Modify the DOS 5.0 editor to display files with any extension		335
407	ScanMan Model 256/GS with OCR Bundle	Logitech Inc.	60	User-to-User	A batch file that can repeat a command up to 99,999,999 times		337	Windows	How to improve Program Manager's use of FSRs		341
496	UltraStor Ultra 22CA EISA Caching ESDI Disk Controller	UltraStor Corp.	260	Windows	The easiest way to get rid of the Microsoft start-up logo.		341	Windows	What to do when a DOS program blocks LPT1.		341
496	UltraStor Ultra 22F EISA ESDI Disk Controller	UltraStor Corp.	260	The Working Word	Why your PIC files may not print if you've changed Windows' colors		343	Windows	Macros that quickly cover up your document and require a password to redisplay it		343
497	Wyse WY-951 EISA Turbo ESDI Drive Controller	Wyse Technology	262	The Working Word	Using more than one set of x coordinates on the same x, y chart		347	Connectivity	Novell's ODI architecture lets you run multiple protocols simultaneously		351
KEYBOARDS				Connectivity	A new source of help for those considering a move to Micro Channel		351	Connectivity	The importance of testing unshielded twisted-pair wiring		351
456	ALPS MDS101	ALPS America	308	Connectivity	Introducing the new PC Magazine Labs Benchmark Series, Version 6.0		353	PC MagNet			
474	PCD Maitron Ergonomic Keyboard	Applied Learning Corp.	314	PROGRAMMING				Utilities	Rid Your Disk of Duplicate Files with SHOWDUPE.EXE.		355
				Lab Notes	Anatomy of a Utility: Writing Applications with C++		361	Environments	Experimenting with Additive Synthesis in Multimedia Windows		373
				Power Programming	Making an Ordinary Windows Application Pen-Aware		381	Databases	Avoid the pitfalls of command scope in dBASE-compatible languages		389
				Languages	Modify the date and time stamp on any file with this QuickBASIC routine.		393	Languages			

After Hours

Products for the Leisure Side of Personal Computing

Learn to Animate from The Experts at Disney



Once upon a time, cartoons were standard Saturday afternoon fare at the local theater; next they moved to Saturday mornings and the living room TV. Now they've made it to your PC, only this time you are the cartoonist.

Disney Presents the *Animation Studio*, a \$129 animation tool, gives you the ability to create sophisticated Walt Disney-like cartoons with full sound and motion. Finished works can be shown on a PC as a self-running program or exported to videotape and played on a VCR.

Creating animation is much more complicated than drawing a static illustration. You must produce a

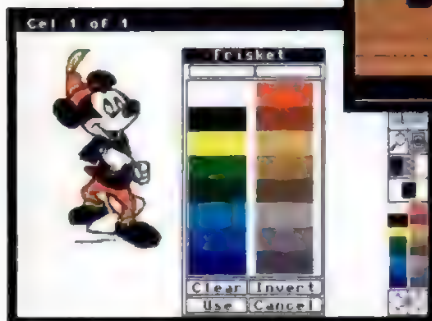
series of images that tell a story by moving convincingly across a coherent background. This involves controlling sound effects and the timing of each action.

artists use to check the flow of the animation. In the software, the Pencil Test module is a black-and-white editor that lets you create electronic cels. A series of drop-down menus and tool-boxes provide basic drawing tools including lines, circles, rectangles, brushes, cut-and-paste, text, and magnification.

You can superimpose sequences of drawings on top of each other, like laying several onionskin pages on top of each other. And a projector icon lets you test your creation in motion.



Disney's *Animation Studio* uses its frisket tool to import an image (Mickey Mouse) into another frame without overwriting the contents of that cel (the background).



series of images that tell a story by moving convincingly across a coherent background. This involves controlling sound effects and the timing of each action.

To accomplish all of this, *The Animation Studio* is really several programs in one; each component offers some electronic version of traditional cel animation tools. In conventional animation, each cel is a sheet of onionskin paper or clear acetate. A pencil test is a quick sketch

The Exposure Sheet is accessed from the Pencil Test. Here, you give an order and timing to the cels, add sound effects, enter comments, and edit frame by frame—much like editing a traditional movie.

Finally, you add color to cels and combine them to form complete drawings within the Ink and Paint program. The tools here are similar to those in Pencil Test. You can choose 256 colors from *The Animation Studio*'s total palette of 256,000.

One of *The Animation Studio*'s strongest features is an excellent tutorial that introduces users not only to the program's features but to the techniques of designing and producing cartoons as well. Familiar characters demonstrate animations that move and talk with Disney style. Donald works on a computer, Lady runs across the screen (looking for the Tramp?), and Tweedles Dee and Dum dance madly. All provide detailed examples of how to create polished animations.

Animation Studio file formats won't be familiar to most PC users. The Independent File Format (.IFF) is a bitmap file more popular on Amigas, Anim (.ANM) is an Amiga format, and CFast (.CFT and .CFC) is a proprietary *Animation Studio* format. A utility program converts files between .GIF, .IFF, .PCX, and TIFF formats. And to put a cartoon on videotape, you must have a display adapter that can export a standard composite TV signal.

The Animation Studio is an ideal product for children of any age who want to learn about animation, provided they are motivated; the route to cel animation

■ **ENTERTAINMENT**
Leisure Suit Larry returns—seeking out America's sexiest siren.

For armchair Olympians: *The Games: Winter Challenge*.

■ **FLIGHT SIMULATION**
Chuck Yeager is your copilot with Electronic Arts' *Air Combat*.

is not easy. The manuals lack an effective index, but they provide an excellent introduction to the art of creating cartoons in the Disney manner. And while the program is designed for home users, it offers many advanced tools for less than the price of most paint programs.

List Price: *Disney Presents the Animation Studio*, \$129.

Requires: 640K RAM, CGA graphics or better, DOS 3.0 or later. Expanded memory recommended. Disney Software, 500 S. Buena Vista St., Burbank, CA 91521; 800-688-1520, 818-841-3326.

CIRCLE 408 ON READER SERVICE CARD

Leisure Suit Larry 5: Is the Love Affair Over?



Larry Laffer's latest adventure has all the ingredients of one of those not-so-steamy porno flicks that you watch in a two-star hotel in the hopes that you'll be bored to sleep quickly so you can get up for your 7:00 A.M. meeting.

Titled *Leisure Suit Larry 5: Passionate Patti Does a Little Undercover Work*, the \$59.95 game starts off with the pornographically promising premise of a talent search for the country's steamiest siren to host "America's Sexiest Home Videos." Our antihero is elected

CONTINUES

After Hours

Leisure Suit Larry 5

CONTINUED

talent scout, on the presumption that the white-garbed Elmer Fudd of the nineties could stir the hormones of only the most over-sexed female.

While Larry searches for the babe with the biggest boobs, Patti has her own encounters with men endowed with big teeth, big pecs, and big hair. The FBI recruits Patti away from her dreary life to uncover evidence that a recording engineer and a rap star are using subliminal messages to corrupt our country's youth.

Disappointingly, the game was only good for some mild chuckles. Throughout *Larry 5*, the media, pornographers, con-

servatives, and the musical-industrial complex all fall prey to some sort of ribbing. But these targets are so self-parodying that it's hard to wring anything new or especially funny out of them. The puzzles were exceptionally easy (for an intermediate-level player); the only stumblers turned out to be places where there was nothing you *could* do! And despite the "Parental Discretion Advised" warning labels on the box, there seemed to be *less* sex, eroticism, and innuendo than in previous *Larrys*.

Still, there are some new things in this version of *Larry*. Most prominently, the game now boasts a different visual style, sort of an abstract watercolor, retro-Jetsons look, which is quite different and interesting. Also welcome is the fast-forward option, which allows you to skip over the mini-movie sequences

in which the user has nothing to do but watch. And finally, Larry can't die—not even if you stick his finger in an outlet. (I know—I tried!)

Larry 5 isn't the only *Larry* to come out this winter. Sierra has performed a 256-color facelift on the original *Leisure Suit Larry* in the *Land of the Lounge Lizards*. If you've never had the pleasure of Larry's acquaintance, you're probably better off playing the original. Just like "Moonlighting" after David Addison and Maddie finally shut up and puckered up, *Larry* has run just one episode too long.

List Price: *Leisure Suit Larry 5:*



Leisure Suit Larry 5's new watercolor-like graphics style adds life to an otherwise average sequel.

Passionate Patti Does a Little Undercover Work, \$59.95.

Requires: 286-based PC or better, 640K RAM, hard disk, VGA or MCGA display, DOS 2.0 or later. Sierra On-Line Inc., P.O. Box 485, Coarsegold, CA 93614; 800-326-6654, 209-683-4468.

CIRCLE 490 ON READER SERVICE CARD

Winter the Thrill of the Olympics Without Ever Leaving Your Keyboard

ENTERTAINMENT
by Don Nivette

If Albertville, France and the 1992 Winter Olympics are beyond your athletic prowess or financial means, Accolade hopes you'll find solace in *The Games: Winter Challenge*. From the opening pageantry through to the closing ceremonies, you are the gold-medal athlete of these Alpine games.

Everyone starts with the luge because it looks like so much fun to hurl blindly down an icy course at 60 miles per hour, feet first, belly up. It is. Banking into turns, you must hold true to center on the straightaways for the best time. Miss just one curve and

you'll shoot over the embankment in a chilling wipeout.

Accolade's luge is superb. The graphics and animation in *Winter Challenge* are the best I've seen in competition sports. The program utilizes 256-color bitmapped VGA and has 3-D polygon graphics that sling ice crystals in your face. The view is that of the sledder: low and fast, with the foreground mountains shifting and changing just enough to produce an awesome sense of downhill racing.

Winter Challenge's other events include the bobsled, cross-country and downhill skiing, speed skating, giant slalom, the biathlon, and the ski jump. The bobsled was too much like the

luge to hold my interest, but the skiing definitely kept my adrenaline going.

Who on the beginner's slope hasn't dreamed of tearing down a mountain at 80 miles per hour, dropping hundreds of feet in just seconds? The careful manipulation of foreground and background produces a 3-D sensation as you crest hills and ride ridges along the course. If you aren't sure why you ended up buried 6 feet under a snowbank, the VCR feature will let you replay the action.

Cross-country skiing was too much work for me: It was my worst aerobic nightmare. The biathlon (skiing and shooting), speed skating, and the giant slalom also proved not to be my favorite events. Instead, the ski jump lured me to its icy edge. Push forward on the joystick to push off, manipulate the stick back and forth during flight to

keep the skis parallel, and press the fire button at the exact moment of impact... or else find a good orthopedic surgeon.

There's more to *Winter Challenge* than practice runs, although that's my favorite mode. The competitive player can participate in tournaments with a combination of real friends and computer-generated opponents.

While *The Games: Winter Challenge* runs adequately on slower machines with EGA graphics, a fast computer (20 MHz or better) with Super VGA graphics makes this game the next best thing to being there.

List Price: *The Games: Winter Challenge*, \$54.95. **Requires:** 640K RAM, EGA graphics or better, DOS 2.1 or later. Accolade, 559 S. Winchester Blvd., San Jose, CA 95128; 800-245-7744, 408-296-8400.

CIRCLE 500 ON READER SERVICE CARD

The Games: Winter Challenge features excellent graphics to heighten the simulation of—in this case—the ski jump.



All You Ever Wanted To Know About Weather, Now On-line

by Don Nivette

Everyone talks about the weather, and now someone has done something different about reporting it. *WeatherBrief* lets

you download, display, and print maps, forecasts, charts, radar, and even satellite photos from the comfort of your own keyboard. Located in Salt Lake City, Utah, WeatherBank has been in

CONTINUES

After Hours

WeatherBrief

CONTINUED

business since 1972, collecting meteorological data and making forecasts for private concerns. The continued improvement in computer graphics has spurred the company to offer a \$53 package for the PC.

The comprehensive *WeatherBrief* software offers many choices of reports and maps for you to download and display with its menu-based interface. This data may be saved in up to eight subsets and tagged with names. For example, one group might be called "Hurricane Data" and consist of the tropical weather outlook, hemisphere hurricane map, beach-erosion forecast, and East Coast hurricane-tracking map. Another set might contain maps and reports important to private aviation.

WeatherBrief lets you save up to 300 maps, reports, and forecasts from the 5,000 available weather products. There's truly something for everyone: the 18-hour winds aloft forecast; discussions about highway conditions, heavy snow, and the latest earthquakes; the excessive rainfall outlook, buoy reports, an air-quality index, lakeshore warning statements, and isographic charts. Many of these can be applied to the United States as a whole or to specific geographic regions.

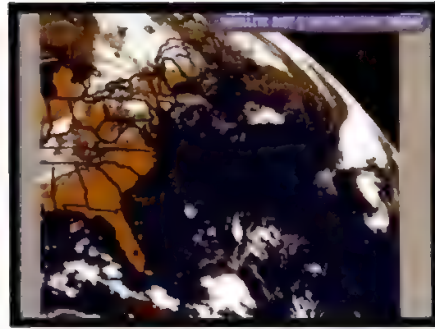
Much of the information comes from government weather sources and is updated according to a schedule, the data then becoming available to *WeatherBrief* users as soon as it comes off the wires. However, lightning-strike data is purchased from a private company. It's priced according to timeliness and location. Real-time lightning coverage for the entire U.S. costs \$1,600 per month.

Once you've picked the reports you want, *WeatherBrief* calls the computer in Utah and downloads the information. In this well-designed program, on-line communications are performed by a TSR, which can be set to download information automatically at preset intervals

during the day, and you can begin looking at forecasts while the program is downloading data.

With the exception of lighting data, all information is priced by connect time and calling method. Charges for accessing the WeatherBank computer via an 800 number run 43 cents per minute during business hours and 30 cents per minute after hours; connect time to an 801-area-code number costs 20 cents per minute plus phone charges. With a few exceptions such as intensive isographic charts, data downloads surprisingly fast. In 3 minutes at 2,400 bits per second, I can get the latest regional forecasts, radar maps, and a satellite photo.

WeatherBank does not send monthly statements for less than \$15; it prefers that you keep a credit balance in your account.



This satellite photo was downloaded in seconds from WeatherBank's mainframe using *WeatherBrief* and a 2,400-bps modem.

The communications program displays a running total (just like a gasoline pump) as you download data. Monthly charges are also displayed, and you may enter a credit-card number to replenish your account as the balance nears zero.

In addition to hobbyists, *WeatherBrief* is a valuable tool for many who rely on weather information in their workday

lives. Easy to use, chock-full of useful information, and economically priced, this software is a real value.

List Price: *WeatherBrief*, \$53.
Requires: 512K RAM, EGA graphics or better, modem, DOS 3.0 or later. WeatherBank Inc., #315, 5 Triad Center, Salt Lake City, UT 84180; 801-530-3181.

CIRCLE 501 ON READER SERVICE CARD

Lettered Blocks Spell A New Challenge For Tetris Fans

ENTERTAINMENT
by Cathy Kunkemüller

Good news for *Tetris* groupies: Spectrum HoloByte has come out with *Wordtris*, yet another game to entrance your mind and fingers. A word-forming *Tetris*, *Wordtris* strains your ability to build words while it tests your luck and manual dexterity.

Wordtris (\$44.95) plays like *Tetris* but with some new twists: Blocks drop out down into a well; you maneuver them around and try to keep the well from filling up. But each block now has a letter on it, and the well is half-filled with fluid. Falling letters push down on the ones below and form a crossword grid; each "spelled" word is removed from the well. Spelling out the

Magic Word that is provided with each new level also clears the well of unwanted blocks and adds mega points to your score.

Wordtris is not as easy as you might think, so be sure to read the helpful hints in the back of the manual. Inadvertent combinations of letters can undo the best planning and the strongest vocabularies. *Wordtris* probably won't increase your vocabulary, either, since it relies heavily on those three- and four-character words (like *cat* and *sand*) that are usually overlooked in high-skill word games.

You can manually adjust the difficulty mode to one of four settings: Children's, Novice, Advanced, and Expert; you can also jump to a higher level of play. The variations among

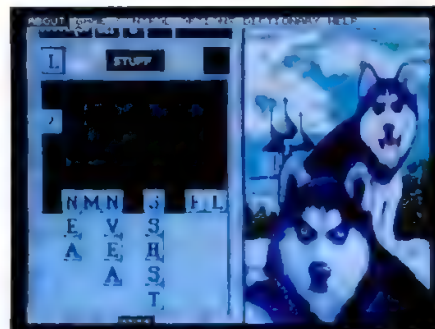
modes include such items as the minimum letter requirements for words (three or four characters), the number of letters in the Magic Word, and scoring. As in *Tetris*, higher levels control the rate at which the block drops. The Expert mode (alias the Give-It-Up mode) features blocks falling at a speed beyond any normal human reaction times.

Like any game trying for multiple appeal, *Wordtris* probably won't attract either word-game or *Tetris* purists. The time needed to recognize possible word formations prevents the super-fast speed obtainable on *Tetris*. And the fact that the game accepts three-letter words detracts from intricate word forming, unless you master the proper strategy or alter the game's dictionary.

Still, *Wordtris*'s more demanding play means that you won't suffer the intense finger cramps *Tetris* fans experience on their umpteenth level. I found the number of tricks to master particularly challenging. Just keep an eye out for the eraser blocks and you're well on your way to spelling success.

List Price: *Wordtris*, \$44.95.
Requires: 640K RAM, CGA graphics or better, DOS 3.0 or later. Spectrum HoloByte, 2061 Challenger Dr., Alameda, CA 94501; 510-522-3584.

CIRCLE 502 ON READER SERVICE CARD



Wordtris's lettered blocks and fluid-filled well add a crossword-like dimension to the latest variation on the Tetris theme.

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— PC Computing

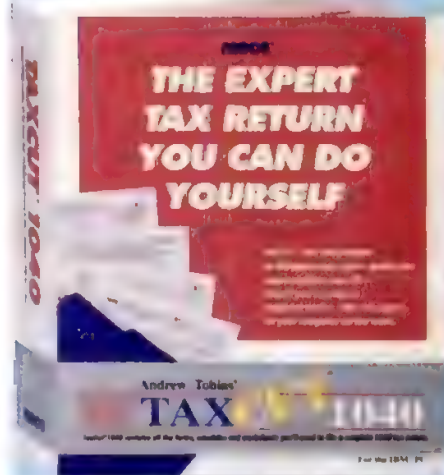
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CIRCLE 376 ON READER SERVICE CARD

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After Hours

Fly Combat Missions With Chuck Yeager

FLIGHT SIMULATION
by Tom Unger

Designed to give *Flight Simulator* joystick jockeys something more to do than flying the shuttle route from New York to Boston in a lowly Cessna 182, *Chuck Yeager's Advanced Flight*

Trainer purported to teach you something about *real* flying. The hook was the down-home face of Chuck himself, which after every crash would fill the screen to admonish you about how you had to "be a bit more careful there, or you'll auger in every time."



Chuck Yeager's Air Combat lets you man the controls of several aircraft, including the F-4 Phantom II shown here.

Now, Chuck is back with Electronic Arts' \$59.95 *Chuck Yeager's Air Combat*, a game that mixes a bit of aviation history with a heavy dose of flight simulation. The game features superb orthogonal graphics, an ethereal dithered sky background, and superior digitized sound. And Electronic Arts has lent an educational bent to what would otherwise be just another flight simulator. Not only does Chuck come along as your spiritual copilot, letting you know when "there's a bogey on your six," but you have the opportunity to fly the planes Yeager flew in three wars: World War II, Korea, and Vietnam.

Each era gives you about a dozen canned missions in different types of planes, from American P-51 Mustangs to Russian Mig-17s. The missions, which are designed to mimic actual historic engagements, are evenly split between the Americans and their one-time foes, the Germans,

the North Koreans, and the North Vietnamese. Yeager "steps in" after you're done to let you know how it went historically, and how you did in comparison with Yeager or one of his compatriots. Should you tire of preprogrammed missions, the game has an exceptional mission builder.

In the spirit of Lucasfilm Games' *Their Finest Hour*, *Combat*'s manual tells you as much about the featured aircraft as you'll ever want to know, and maybe more. And although this gem might not have the educational punch of, say, *Where in the World Is Carmen Sandiego?*, kids, armchair pilots, and flight-simulator groupies will find it a whole lot more exciting. ■

List Price: *Chuck Yeager's Air Combat*, \$59.95. **Requires:** 640K RAM, CGA graphics or better, DOS 2.10 or later. Electronic Arts, P.O. Box 7578, San Mateo, CA 94404-7578; 800-245-4525, 415-572-2787.

CIRCLE 803 ON READER SERVICE CARD

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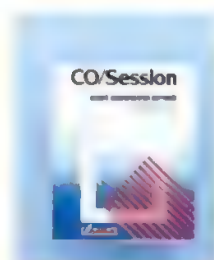
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| ☐ color/size matrix | ☐ 99 levels of password protection | ☐ pop-up calculator |
| ☐ multiple pricing levels | ☐ tracks promotional sales | ☐ built-in word processor |
| ☐ track inventory by size/color/style | ☐ prints bar code labels | ☐ works on any IBM PC or compatible with hard disk drive |
| ☐ mailing labels | ☐ reorder reports | ☐ Multiuser and source code available |
| ☐ track customer history | ☐ extensive sales reports | ☐ dBase compatible compiled with Clipper... |
| ☐ daily closeout reports | ☐ item/invoice discounts | |
| ☐ accepts split tender | ☐ tracks sales by employees | |
| ☐ view in-stock status | ☐ set limited-time promos | |

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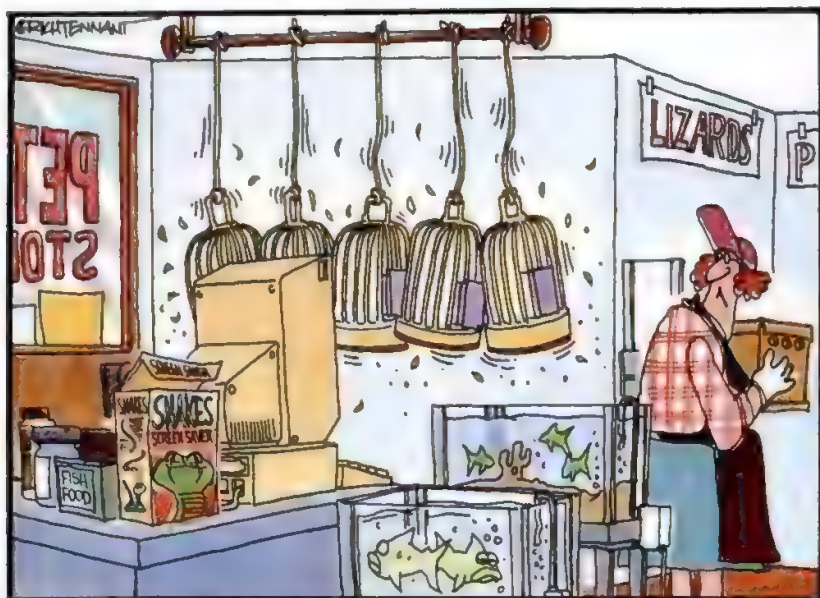
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by
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Abort, Retry, Fail?

The Lighter Side of Personal Computing



"WELL, HECK—I CAN'T STEP AWAY FROM THE COMPUTER FOR A SECOND WITHOUT YOU BIRDS GETTIN' ALL RUFFLED ABOUT IT."

Amazing Facts: The Dual Math Coprocessor PC

"The [AST-Calcomp] partnership's first product is the \$8,995, 23.5-Mips Medallion workstation. Based on a 33-MHz Intel 486 processor, the Medallion comes with a standard 8 Mbytes of memory and a 120-Mbyte hard drive, a built-in 387 coprocessor and a 20-inch multisync color monitor that can display up to a 1,280 x 1,024 resolution." *Electronic Engineering Times*, October 21, 1991

Not a Penny More Than It Was Worth

"These major industry events happened as a result of Borland International Inc.'s recent intense negotiations with the Department of Justice for the approval of its \$440 acquisition of Ashton-Tate." *InfoWorld*, October 21, 1991

Calibrate works without damaging any data that is already on your disk. Therefore, there is no need to back up and restore data in order to change the interleave when using Calibrate. Calibrate is so safe that even low-level formatting will not

...and reports its findings.

WARNING: You should back up your hard disk before running Calibrate for the first time. The Norton Calibrate

The Norton Utilities' Calibrate is so gentle it won't harm your hard disk and there's no need to make a backup... but just in case, you should make one anyway. Notice, also that the manual doesn't give you a clue as to which "few programs" might be affected.

Non-Interlaced OptiQuest 72MHz Refresh Rate, 68 Resolution At .28 DP

...systems deliver the crispest flicker-free image in Texas--*anywhere!*

At a 72-MHz refresh rate, this OptiQuest monitor sold by Binary Technology Inc., Carrollton, Texas, should generate no complaints about flicker. (72 Hz would be more like it.)

0 MB hard drive
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controller w/floppy controller. Supports
data transfer up to 10 MBYTS/SEC. DMA
DEC, IBM

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REWRITABLE	\$3595.00
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California.**

That Would Be a Lot Of Money, at Some Companies

IBM has sunk \$2.5 billion into OS/2 so far, according to *The Wall Street Journal*.

No Wonder the Maxwell Empire's Headed Down the Tubes

The Official Airline Guides, a member of the (Robert) Maxwell Communications Group, sent *PC Magazine* a Macintosh format review copy of the North American Edition of the OAG Flight Disk, a disk-based airline/airfare schedule.

Send submissions to ARF?, PC Magazine, One Park Ave., New York, NY 10016. Winners this issue: Eric H. Berlin (486 machine with 387 coprocessor), Doug Lindsay (Joke box), Mark S. Larson (\$440), Mark J. Murphy (Calibrate, no need to back up hard disk), David Calhoun (Monitor: 72MHz)

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| ☐ i386™SX-based systems | ☐ i486-based systems |
| ☐ i386-based systems | ☐ UNIX® based systems |
| ☐ i486™SX-based systems | ☐ Notebooks |
| | ☐ Other: _____ |

2. Are you interested in computer products for:

- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:

- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?

6. How many PCs do you have installed now at your company?

7. Are you interested in leasing? ☐ Yes ☐ No AD CODE 51BS4

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| ☐ i386-based systems | ☐ UNIX® based systems |
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| | ☐ Other: _____ |

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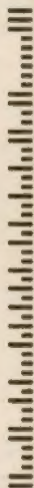


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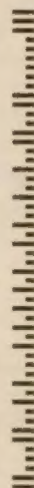


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Lease: from \$93/MO.**

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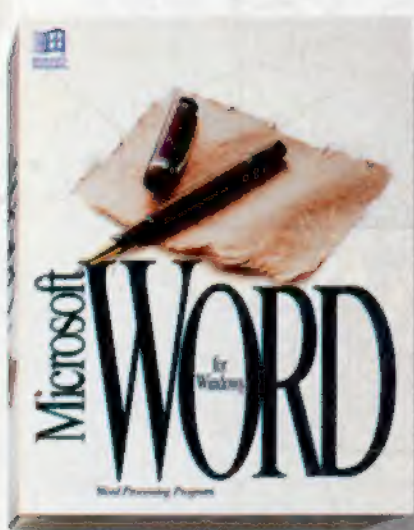
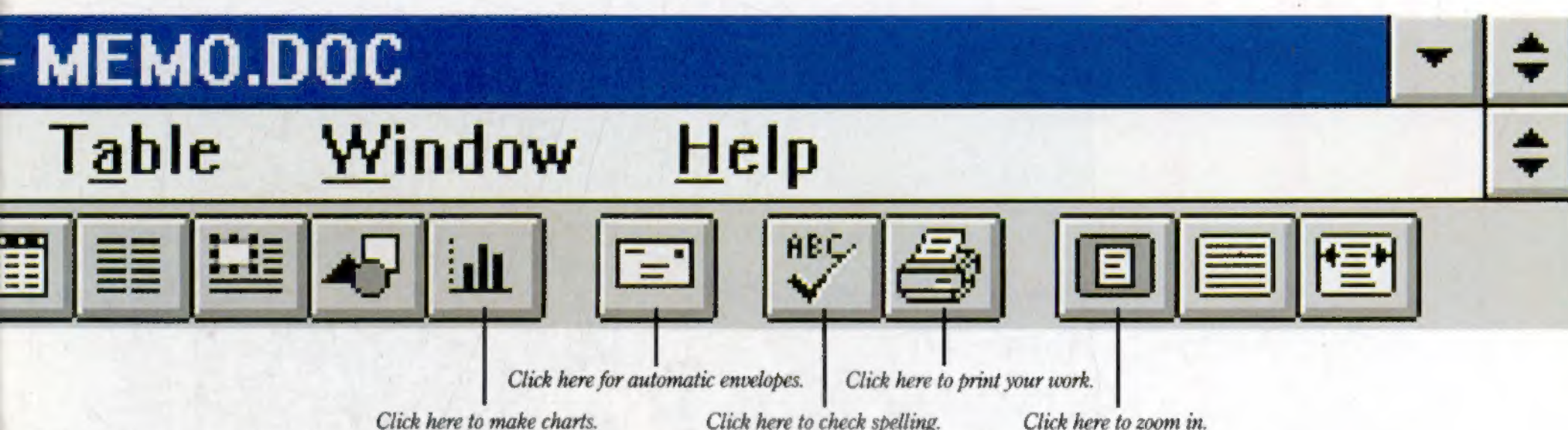
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